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The Journal is the official organ of the American Academy of Periodontology and will contain, therefore, those papers of scientific and clinical interest which are presented at the annual meetings of that society. Abstracts of important articles related to periodontology that appeared during the year of 1945 will be published in this year's issues.

We are grateful to all who have made available the subject matter from which the abstracts and copies of abstracts have been made, including the authors of the original articles, owners of the journals mentioned in the text of the abstract section, and those who have aided by contributing the material for this issue.

THE JOURNAL OF PERIODONTOLOGY

APRIL, NINETEEN HUNDRED FORTY-SIX

Discolorations of the Oral Mucous Membrane by Metallic Foreign Bodies[1]

By BALINT ORBAN, M.D., D.D.S.

INTRODUCTION

THE DIFFERENT regions of the oral mucosa frequently reveal dark blue or brownish spots in tooth-bearing as well as edentulous areas. Such discolored spots might be pigmentations, as are frequently observed in individuals of dark complexion: they may be pigment nevi (moles, blue nevi) or discolorations due to diseases (Addison's disease). Metallic elements, such as arsenic, lead, and silver might cause discolorations in the oral cavity; this might also be said of metallic drugs, such as bismuth and mercury. Moreover, discolorations are said to be produced by galvanic currents generated in the oral cavity, due to dissimilar fillings, and also by metallic foreign bodies, such as silver and amalgam.

FINDINGS

Amalgam frequently becomes incorporated into the tissues as the result of fragmentation during extraction (Fig. 1A). Amalgam fragments may lodge in the wound and remain in the socket after healing (Fig. 1B). Such foreign bodies of amalgam have been observed to remain in the jaws for many years. They are frequently found in routine roentgenographic examinations[2] (Fig. 2) but they seldom cause symptoms. In one case reported by L. R. Cahn[3] a silver amalgam mass in the jaw caused considerable tissue reaction due to pressure by a saddle bridge.

When such amalgam remnants are located superficially, the mucous membrane covering them shows a deep blue discoloration (Fig. 3A). In the present case there also was a discoloration of the corresponding interdental papilla on the lingual side. In the roentgenographic examination radiopaque particles can often be observed in these areas (Fig. 3B).

Histologic examination[4] of the lingual interdental papilla revealed the presence

[1] From the Department of Research, School of Dentistry, Loyola University, Chicago College of Dental Surgery.

[2] LeRoy M. Ennis, *Dental Roentgenology*. Lea and Febiger, Philadelphia, 1931. Pages 266-280.

[3] Cahn, Lester R., Silver Pigmentation of the Gums, *Arch. of Clin. Oral Path.* 2:41, 1938.

[4] The biopsy specimens of this kind must be fixed in formalin instead of Zenker's solution; Zenker's solution contains mercury and causes metallic precipitation in the specimens which must be removed with Lugol's solution and sodium thiosulphate. By this procedure the metallic parts originally in the specimen also might be removed.

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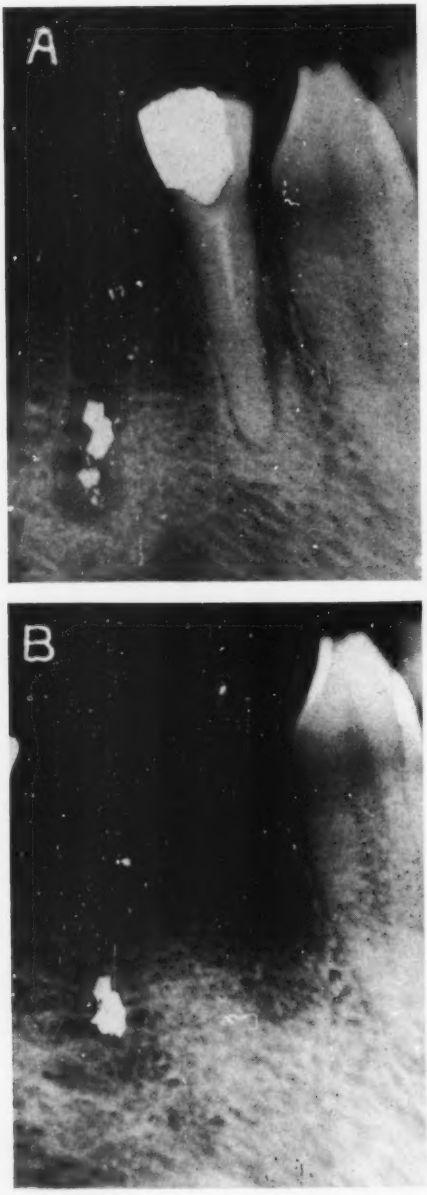

Fig. 1. Amalgam remnants in an extraction wound; A. Immediately after extraction. B. Six months after extraction. [Courtesy Dr. A. W. Maier, Chicago, Ill.]

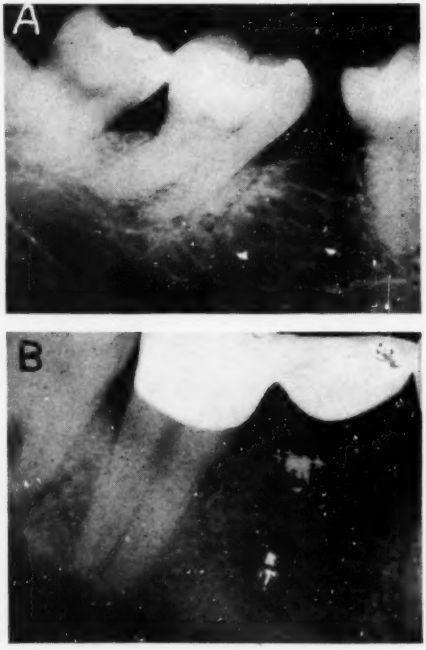

Fig. 2. A. Amalgam remnants in the jaw for over nineteen years. [Courtesy Dr. B. S. Chaikin, Boston, Mass.] B. Amalgam remnants in the jaw below a fixed bridge. [Courtesy Dr. Emil Mueller, Chicago, Ill.]

of metallic material in the subepithelial connective tissue (Fig. 4). The metallic material was apparent as a black precipitate of fine particles in the connective tissue, the walls of blood vessels (Fig. 5A), and the connective tissue of nerve trunks. It also appeared within phagocytes and in large amorphous clumps.

A similar specimen was obtained from a patient who showed a bluish discoloration of the gingival papilla between two lower bicuspids (Fig. 6A). The corresponding roentgenogram revealed small radiopaque objects in this area (Fig. 6B). The patient was in the possession of some roentgenograms made ten years previously which also revealed the radiopaque particles in the interdental papilla. The blue spot was visible in the biopsy specimen especially after the specimen was washed with water and the blood removed. The microscopic specimen of this papilla reveals some finer and some

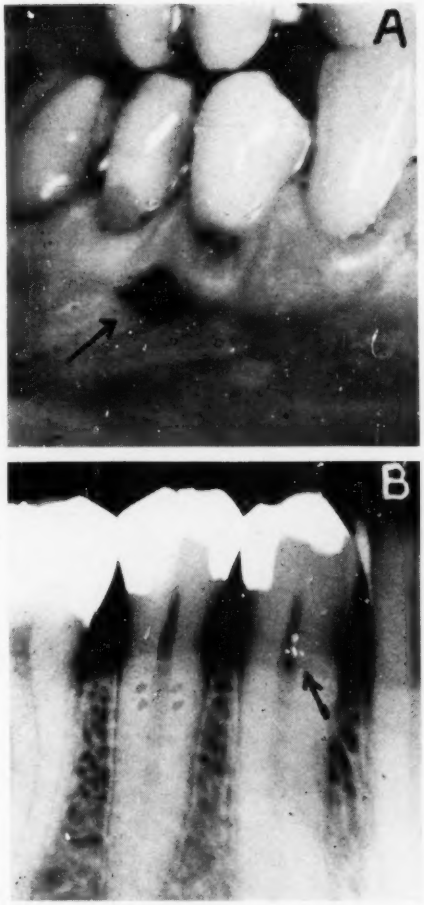

Fig. 3. A. Discoloration of the mucous membrane in the bicuspid area. B. Roentgenogram reveals some radiopaque objects in the region of discoloration. [Courtesy Dr. F. R. Garvey, St. Paul, Minn.]

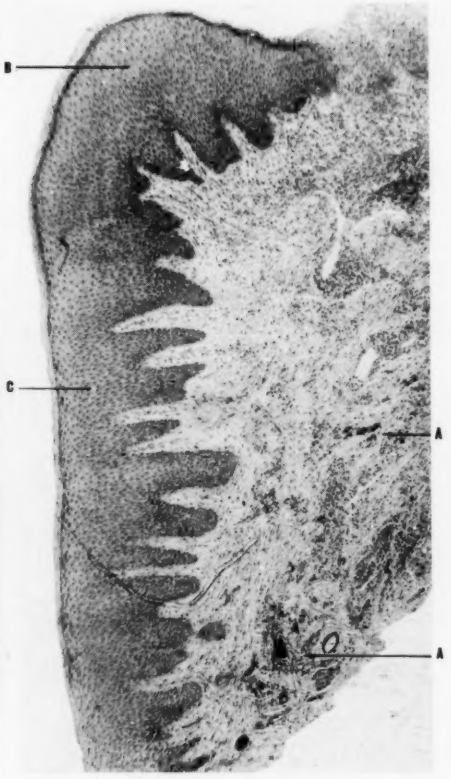

Fig. 4. Microscopic specimen of a blue discoloration area of case shown in Fig. 3. (Lingual interdental papilla); A. Dark spots in the tissue are metallic objects. B. Gingival margin. C. Epithelium of mucous membrane free of metallic precipitates.

larger metallic deposits in the connective tissue (Fig. 7).

Close to these metallic particles a cyst near the surface of the interdental papilla can be seen. This is the only cyst ever observed by the writer in the gingival papilla. The cyst was filled with a clear fluid, which coagulated and shrank in fixation. In some sections metallic particles were very close to the cyst wall, some were even within the epithelial wall of the cyst.

Examination with high magnification (Fig. 8) shows many giant cells surrounding the metallic deposits. There are some phagocytes, lymphocytes, and plasma cells present, but no polymorphonuclear leukocytes. This is a chronic granulation tissue of long standing. Some of the finer metallic dust particles lie within phagocytes, some free in the intercellular substance. No deposits are seen in the epithelium of the mucous membrane.

"Blue spots" can often be seen in edentulous areas of the jaw, due to amalgam remnants lodging in the tissues after extractions. If these remnants lie close to the surface, above the bone, and not in the socket, (as seen in Figs. 1 and 2) blue discolorations might occur. One such case

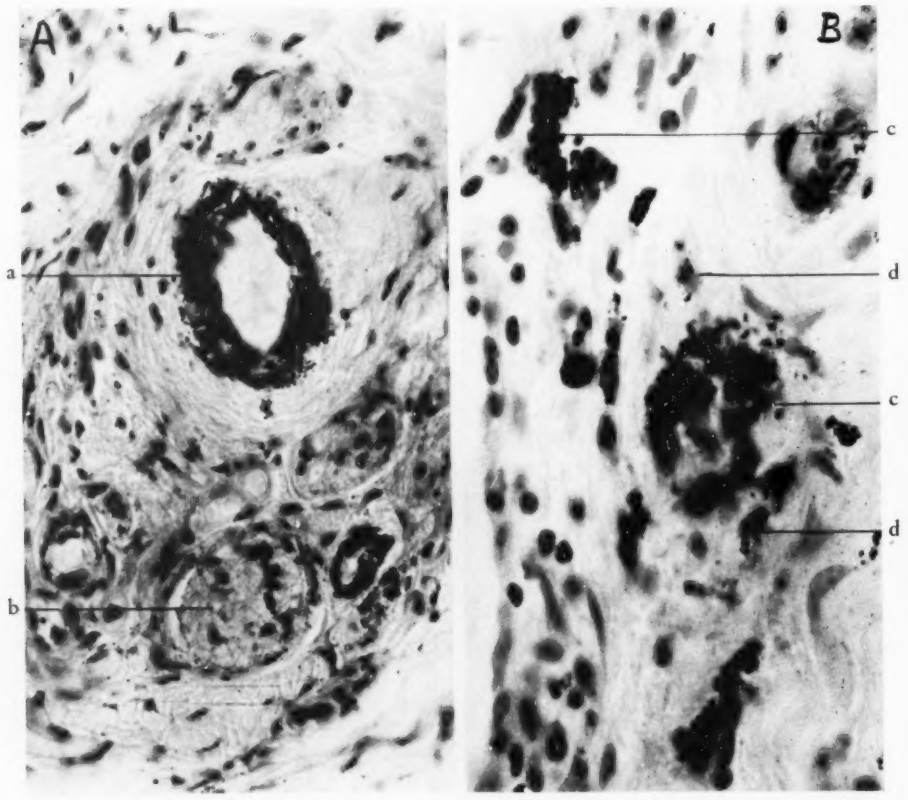

Fig. 5 High magnifications of the metallic remnants in the tissue, shown in Fig. 4; A. Metallic deposits finely dispersed. Most deposits are in the wall of blood vessels (a) and in connective tissue of nerve trunks (b). Fine granules are also found free in the tissue. B. Metallic deposits in heavy clumps (c). Some fine metallic granules are also seen within phagocytes (d).

with the corresponding roentgenogram and photomicrogram is seen in Figs. 9 and 10.

This blue spot was surgically removed and sectioned for microscopic examination. Large amounts of silver mercury deposits could be found (Figs. 10A and B). The metallic deposits are in fine granules, following the boundary between epithelium and connective tissue. The metal is precipitated in the connective tissue fibers of the basement membrane, lamina propria, and also in the submucosa. Some of the fibers are impregnated with silver as in a specimen treated with the silver impregnation method.

Some of the metallic deposits occur in the intercellular substance, some in phagocytic elements. Some are surrounded by foreign body giant cells. In the deeper layers larger clumps of metallic deposits are seen.

Ever since the writer's attention was focused on such and similar findings, it seemed that such discolorations occur rather frequently.

Other discolorations of the oral mucous membrane definitely not from amalgam remnants also were observed. One of these cases concerns a young girl ten years of age, who has a deep blue discoloration of the oral mucous membrane somewhat laterally of the left maxillary central incisor (Fig. 11A). The discoloration lies at the border line of gingiva and alveolar mucosa[5] and was especially disturbing because the patient is short lipped and exposes this dis-

[5] For Nomenclature—See Orban, B. and Sicher, H. The Oral Mucosa. *The Journal of Dental Education* 10:94; Dec. 1945.

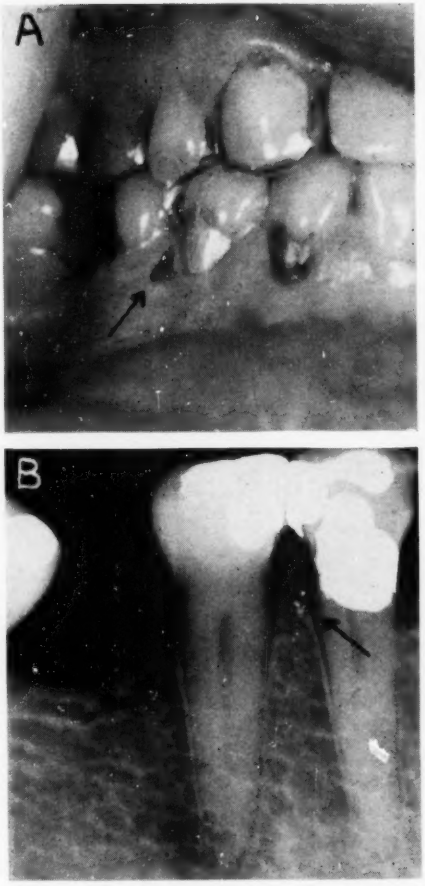

Fig. 6. A. Bluish discoloration of the interdental papilla between the bicuspids. B. Roentgenogram reveals radiopaque objects in discolored area.

colored area when she smiles. The roentgenogram of this region shows radiopaque spots (Fig. 11B). The history of this case revealed a root canal treatment of a deciduous incisor. As was ascertained from the dentist performing the treatment, a silver containing filling material was used in the root canal. Neither the patient nor the dentist could give the exact date of the appearance of the blue spot, but it is most probable that it appeared after the root became resorbed after the deciduous tooth was removed and some of the filling material remained in the jaw. This case is similar to the one reported by Cahn where a perforation occurred in the root of an upper lateral incisor and some root canal filling material was extended into the tissues.

Another interesting case of discoloration is that of a woman about thirty-five years of age. In childhood she pushed the tip of a lead pencil into her gingiva and broke it. A bluish discoloration occurred in this area which never disappeared (Fig. 12A). According to the patient some years ago a small piece of a foreign body came out of this area. The roentgenogram revealed no radiopaque substance in the region of the discoloration. The patient whose dentition is shown in Fig. 12B had injured her gingiva with a pen many years previously. A blue line is sharply visible above the central incisor. This is probably the residue of the iron and tannic acid complex of the ink.

Cuts produced by carborundum discs also might cause blue discoloration in the oral mucosa. In the case shown in Fig. 12C the alveolar ridge, distally of the second upper molar, was cut on the palatal side by a disc leaving a permanent discoloration.

A different type of discoloration of the oral mucous membrane is caused by pigmentation with melanin. Melanin is the normal pigment material of the human skin. It is present in varying amounts in the mucous membrane, especially prominent in the Negro race. However, it is also frequently seen in dark complexioned individuals. These melanin pigment spots vary in their shade from blue to brown, depending mainly upon how much and where the pigment is located. If the pigment is deeply seated in the connective tissue the shade is bluish; if it is superficial it is brownish. Sometimes large areas of the mucous membrane are thus discolored, resembling a blue nevus. One unusual case came under observation concerning a white individual of dark complexion. The entire region from cuspid to cuspid in the maxilla as well as the mandible was of deep blue color; the tissue was stippled in this region and slightly rough, but revealed no pathologic symptoms (Fig. 13). Unfortunately no biopsy specimen could be taken in this case.

[6] Cahn, L. R., Silver Pigmentation of the Gums, *Arch. Clin. Oral Path.* 2:41, 1938.

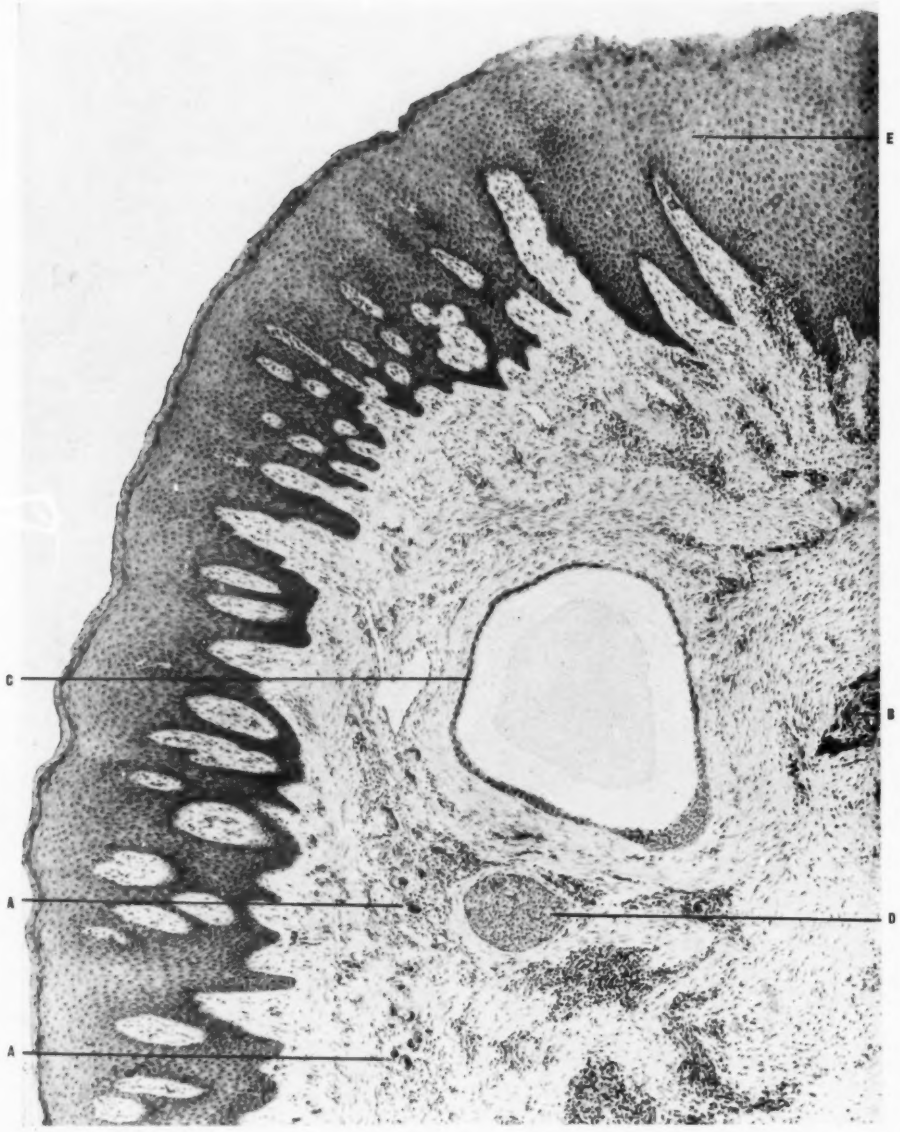

Fig. 7. Microscopic specimen of the discolored papilla in Fig. 6; Finer (A) and more massive (B) metallic deposits in the connective tissue. C. Cyst in the gingival papilla. D. Epithelial pearl. E. Gingival margin.

If the pigment lies in the basal cell layer of the epithelium the color is brownish.

The pigment is found in the basal cell layer of the epithelium as well as in the lamina propria of the mucous membrane (Fig. 16). The pigment in the connective tissue is found in macrophages and in special pigment carrying cells, the chromatophores.

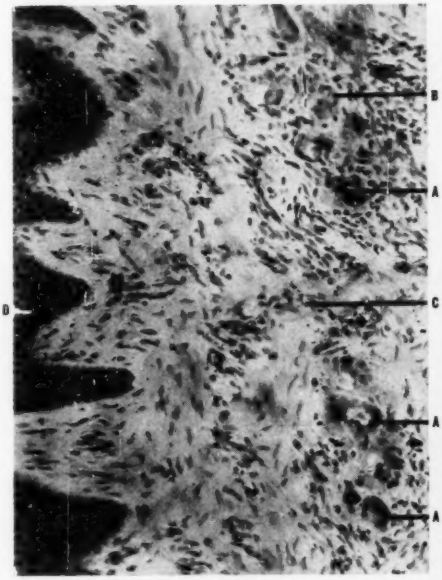

Fig. 8. Higher magnification of the area (A) shown in Fig 7; The metallic deposits are surrounded by foreign body giant cells (A) and chronic granulation tissue (B). Some metallic particles are free in the tissue (C). The epithelium (D) shows no metallic deposits.

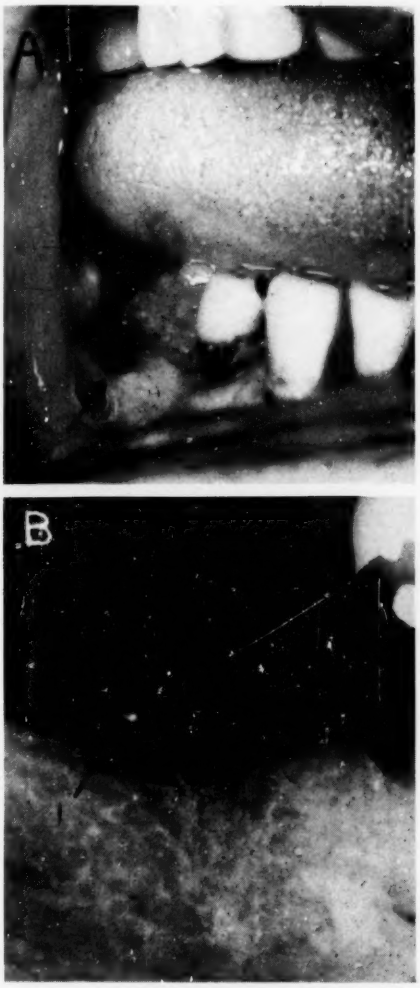

Fig. 9. A. "Blue spot" in an edentulous area. B. Roentgenogram of this area reveals a radiopaque object above the bone.

DISCUSSION

The blue shade of the discoloration in the cases presented here is an optical phenomenon. Dark objects seen through a translucent medium appear blue. Subcutaneous veins appear blue because we see the dark venous blood through the opaque translucent skin. A blue iris contains no pigment. The eye is blue because we see the pigment of the retinal layer through the translucent stroma of the iris. This optic law and its counterpart, that is, that light objects appear red if seen through a translucent medium, was found and expressed by Goethe in his *Farbenlehre*. If the coloring material is brown and lies close to the surface, in the epithelium it will appear brownish-yellow, but if it lies in the deeper layers it will appear blue. As mentioned previously, if melanin is deposited into the deeper connective tissue layers, the discoloration will be of bluish hue, but if the pigment is in the basal cell layer of the epithelium the shade will be yellowish-brown. In some pathologic conditions, like Addison's disease (disease of the adrenal cortex) the pigmentation is increased. There is a case known in dental literature where the Addison's disease was diagnosed by the dentist from the increased pigmentation of the oral mucous membrane[7].

For the purpose of determining the chem-

[7] Landgraf, E. Einige Seltene Stomatologische Falle. *Z.f. Stomat.* 24:443; 1926.

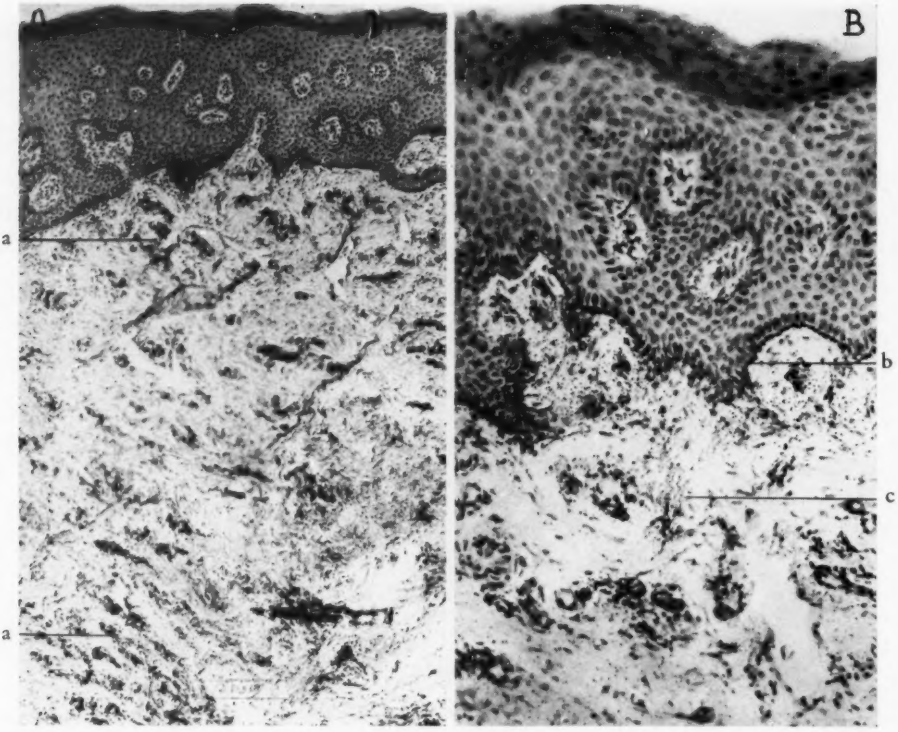

Fig. 10. A. A low magnification of the histologic specimen of the "blue spot" shown in Fig. 9 reveals large masses of metallic deposits all over in the connective tissue (a). B. Some of the metallic deposits are lodged in the connective tissue fibers at the border of the epithelium (b) in the basement membrane; also in other connective tissue fibers (c) and also free in the tissue as heavy amorphous clumps. The epithelium is free of deposits.

ical nature of these metallic deposits some sections of the cases of Figs. 4 and 5 were placed into Lugol's solution. It was assumed that the iodine of the Lugol's solution would form mercuric and silver iodide compounds from the mercury and silver of the amalgam. These are soluble in sodium thiosulphate and could be washed out from the sections. In the present case the above assumption was borne out. The precipitate disappeared from the sections.

To differentiate between silver and mercury precipitates some sections were placed in a chloride solution in order to bring about a transformation of the silver and mercury into their chloride compounds. The silver chloride forms a soluble complex whereas the mercury forms an insoluble compound with ammonia solutions. Thus, although a part of the metallic precipitates disappears, another part remains. This is what happened in the present case.

These chemical tests would indicate that the black precipitate in the sections (Figs. 4 and 5) was amalgam. All fillings in this patient's mouth are gold inlays and therefore the amalgam was most probably lodged in the jaw at the time of the loss of the deciduous teeth which were filled with amalgam.

A. W. Stillians[8] and Th. K. Lawless reported their experience with injections of a mixture of 1% potassium ferricyanide and 6% sodium thiosulphate (equal parts) in

[8] Stillians, A. W. and Lawless, Th. K. The Intradermal Treatment of Argyria. *J.A.M.A.* 92:20; 1929.

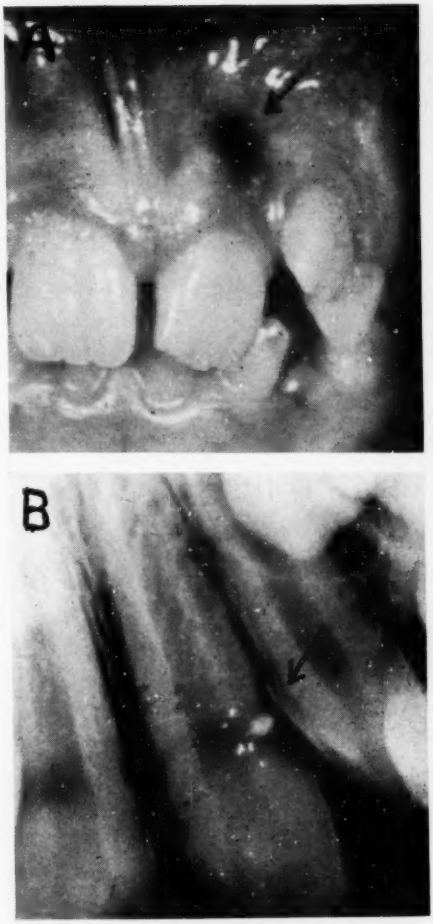

Fig. 11. A. Blue discoloration of the mucous membrane above a central incisor. B. Roentgenogram reveals radiopaque objects in this region. [Courtesy R. E. Huntington, Evanston, Ill.]

treatment of argyria. They could bleach out the discolorations of the skin caused by silver precipitates with these injections. This same chemical mixture is used in photography in reducing the density of some negatives. The solution must be freshly mixed and the use of a local anesthesia is necessary to counteract painful stinging.

The writer tried this method in the case shown in Fig. 11, but one single injection did not lead to the expected result. If possible the treatment will be repeated. This case was selected for this treatment because

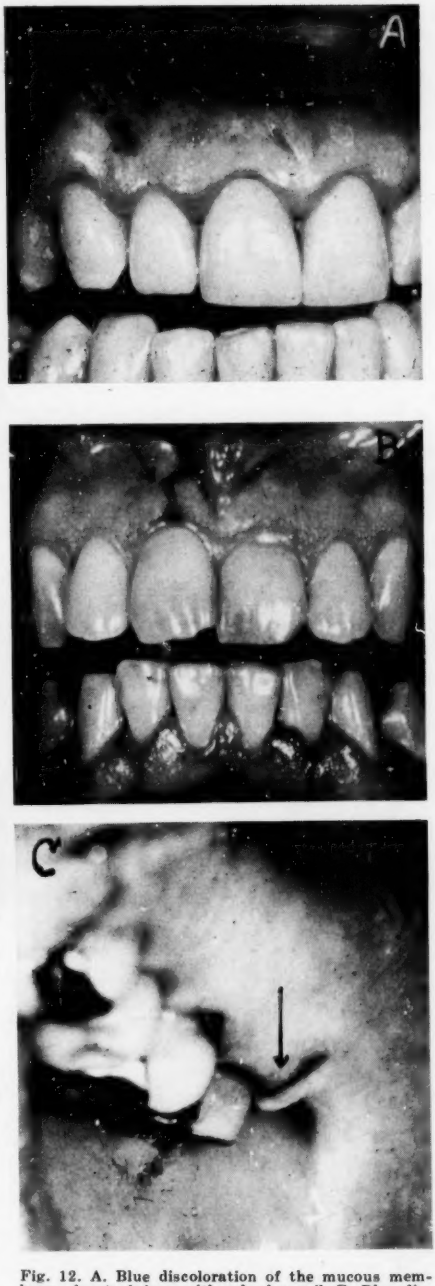

Fig. 12. A. Blue discoloration of the mucous membrane due to injury with a lead pencil. B. Blue discoloration of the gingiva due to injury by pen and ink. C. Discoloration of the mucous membrane of the palate produced by a cut with a carborundum disc.

Fig. 13. Blue discoloration of the gingiva from cuspid to cuspid in maxilla as well as mandible.

it was assumed that pure silver was used in the root canal filling material.

The question of the origin and nature of the cyst in the case shown in Figs. 6 and 7 is of especial interest because of its rarity. The cyst is completely lined by stratified squamous epithelium of a thickness of 2 to 10 cell layers. No hornification occurred and no inflammatory reaction is found anywhere close to the cyst. It is most probable that this cyst developed after a slight injury during an operative procedure, most likely the placing of an amalgam filling. The amalgam plugger may have slipped from the cavity into the gingival papilla, punching the papilla and carrying some amalgam particles into the tissue. Some epithelial elements also could have been carried into the connective tissue providing an anlage for the cyst. The epithelium might also have proliferated along the wound caused by the amalgam plugger, forming epithelial pearls (as also seen in Fig. 7D) in the center of which degeneration might have occurred to form a cyst. We can consider this type of cyst a "traumatic" or "implantation" cyst.

SUMMARY

Metallic masses are frequently found in the gingiva. The metallic remnants consist mostly of amalgam but other metals such as silver, iron or graphite are also found. If these deposits are between the

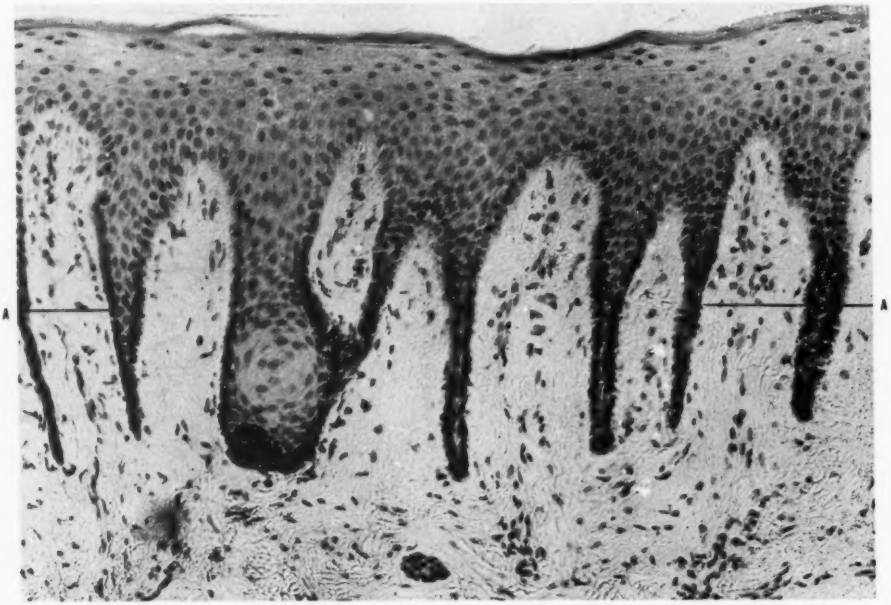

Fig. 14. Melanin in the gingiva. Pigment granules are located mainly in the basal cell layer of the epithelial pegs (A).

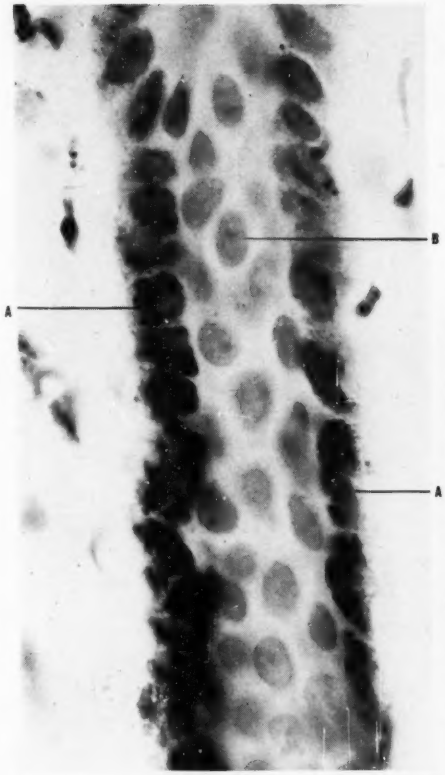

Fig. 15. High magnification of one of the epithelial pegs in Fig. 14. The melanin granules are in the basal cells (A) of the epithelium (B).

bone and the surface of the mucous membrane they cause a blue discoloration.

The metallic material is often of fine granular texture, sometimes forming larger amorphous clumps. Metallic particles are found in the intercellular substance, in phagocytes, and giant cells as well as in the fibers of the connective tissue.

Pigment (melanin) is mostly located in the basal cell layer of the epithelium of the mucous membrane, but is also found in the lamina propria.

A "traumatic" or "implantation" cyst occurring in a gingival papilla is described for the first time. It was most probably caused by a slight injury with an amalgam plugger during an operative procedure.

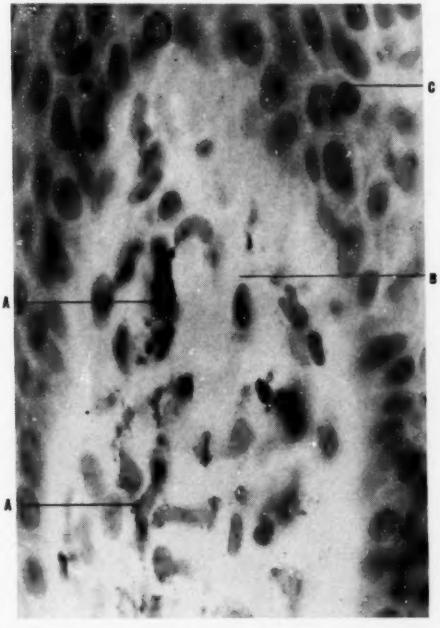

Fig. 16. High magnification of melanin granules within phagocytes (A) in the connective tissue papilla (B). Epithelium (C).

Nutrition and Dental Health

VI. VITAMINS: SUPPLEMENTATION AND THERAPEUTICS

By DOROTHEA F. RADUSCH, D.D.S., B.A., M.S., *Minneapolis 2, Minnesota*

MANY conflicting statements are made both to the general public and in scientific publications concerning the use and value of commercial vitamin products. Exploitation of some of the recent advances in nutrition has led to misinformation and confusion. If a person buys a vitamin product as a panacea and the expected miracle fails to materialize, "the resulting disappointment multiplied many thousand times, may lead to loss of public confidence and eventual rejection of the good in scientific nutrition." (Jolliffe, *J.A.M.A.*, 129: 613, Oct., 1945.)

If a person turns to his physician for advice, too often he receives impatient counsel such as "This vitamin stuff is the bunk," "Vitamins are a racket," "You eat a good diet, don't you?", "Eat three square meals a day, including plenty of milk, meat, vegetables and fruit." As to the latter advice, unless more specific instruction is given, how is the patient to know what constitutes a square meal or plenty of milk, meat, etc.? In other instances, instead of the indefinite general advice, the physician or dentist may prescribe one specific food such as milk or orange juice, or, a vitamin or mineral supplement without making a study of the patient's usual food habits to determine whether such addition is desirable.

Such a case is exemplified by the patient who was told to take 300 mg. of ascorbic acid daily for bleeding gums. When her gums did not improve, she went to another dentist. Upon inquiry it was found that she ate almost all her meals in the drug store. Now, since she did not like either tea, coffee, or milk, but had heard advertising extolling orange juice as a health food, she drank a large glass three times a day with each meal. The meals consisted of toast and jam for breakfast, sandwiches and fountain desserts for both lunch and dinner. The one vitamin supplement the patient certainly did not need was ascorbic acid —instead, she needed sound advice as to her daily food-pattern.

Dietary deficiencies exist in grades of severity. In subclinical states, it is not possible at present to evaluate with accuracy the resulting impairment of health. This lack of specificity in the criteria for diagnosis of states of deficiency, especially of the chronic rather than the acute is the basis for much of the confused opinion on the need for vitamin supplementation. The milder evidences are probably so common, so prevalent, so frequently seen that they are therefore often regarded as normal. Furthermore, even inclusion of foods in proper quantities from each recommended group does not guarantee that all dietary essentials will be obtained in sufficient amounts. There may be differences between individuals in excretion or need for vitamins, or, foods may have lost

nutrients by the time they reach the consumer's plate. Thus, with the patient's best interests in mind, can we dismiss the subject of vitamin intake by stating arbitrarily that all vitamins should be obtained from grocery stores, except for therapeutic use? Let us examine this possibility:

First, there is one substance, vitamin D, which is present in small amounts only in the ordinarily acceptable foods. It is widely believed that since vitamin D is not present in our customary foods, it is not required by the adult. Oddly, such reasoning is not applied to the child's requirements, for it is universally recognized that vitamin D is necessary to prevent rickets. Granted that there is at present no adequate measure for the adult need for vitamin D, we do know that metabolic activity of the mature skeleton occurs constantly. For this it seems likely that vitamin D is of significance. The Food and Nutrition Board of the National Research Council has stated that "for persons who have no opportunity for exposure to clear sunshine and for elderly persons, the ingestion of small amounts of vitamin D may be desirable." Certainly most adults, housewives as well as employed, at least in the northern portion of the United States, have no opportunity for exposure to clear sunshine except that filtered through ordinary window glass. Until further data are available, it seems wise to include vitamin D daily as a safety measure, in amounts at least of 400 I. U. and possibly up to 1000 I. U.

Secondly, the ultimate content of the more readily destroyed essentials in foods upon consumption is dependent on the methods of storage and preparation (*See* preceding article of this series, Jan. 1946). The various factors of the vitamin B complex, and vitamin C are most affected. Farmer (*Federation Proc.* 3: 183, Sept. 1944) made use of destruction by overcooking and steam table storage to obtain food for subjects who were placed on a low vitamin C diet-experiment. The diet was selected from a cafeteria, choosing those articles which were known to be free from ascorbic acid, or which by overcooking and holding on the steam table were shown by chemical analysis to be low or lacking in vitamin C. (Rich sources such as citrus fruits and tomatoes were omitted from the diet.) An individual might conceivably select a diet similar to the one used in the experiment, and so inadvertently subsist on a diet which, without apparent physical symptoms, reduces bodily stores of vitamins to a dangerous degree leaving no margin of safety in event of unusual demand.

The foods chosen were shown by analysis to provide from zero to 5 to 10 mg. of vitamin C daily. The average time required for plasma ascorbic acid to fall to zero under such a diet was 70 days as contrasted to the absolute vitamin C deficient diet of Crandon (*N. Eng. J. Med.* 223:353, 1940) which required 41 days. White cell platelet ascorbic acid dropped more rapidly in subjects deficient in both vitamin C and B complex vitamins.

Thus for those who must depend upon large scale cookery sources for the majority of their meals, even inclusion of foods from all the food groups in the

recommended dietary pattern will not insure adequate intake of essential water-soluble vitamins.

Thirdly, the grocery store can supply the essential nutrients only if people are educated to the proper choice. It cannot be left to chance or appetite. Dietary studies have shown that although the appetite to a remarkable degree adjusts the intake of food energy to the requirement of the healthy individual, in the great majority of cases, the human appetite cannot be relied upon to adjust the intake of the essential nutrients to the requirements of those nutrients.

Granted that a deficiency of calories results in impaired performance more quickly and more markedly than a deficiency of any specific nutrient, still, to a large extent, the energy consumed determines the requirements of specific nutrients. In reviewing this subject, Mitchell (*Federation Proc.* 3:195, Sept. 1944) stated that,

> The more of an unbalanced diet that is consumed, by which is meant a diet inadequate in one or more essential nutrients, the poorer nourished the animal becomes. It has been shown that the time of occurrence of the characteristic deficiency symptoms of polyneuritis in experimental animals is directly dependent upon the amount of deficient food consumed, such that the greater the intake of food the quicker the disease develops. The same relationship has been observed between the onset of scurvy and the ingestion of a scorbutogenic diet. Similarly, the greater the consumption of a rachitogenic diet the slower is the rate of calcification of the bones, and the more milk rats consume the quicker will nutritional anemia develop. Such evidence indicates that the need for thiamine, ascorbic acid, vitamin D, iron and copper at least, is proportional to the amount of food energy to be metabolized, since, when the proportions are inadequate, the respective deficiencies appear in the tissues the sooner, the greater the rate of oxidation of the metabolic mixture. The complete withdrawal of food is a cure for deficiency symptoms or alleviates them, while factors that increase energy metabolism, such as fever, hyperthyroidism, pregnancy, lactation, and excessive muscular work, will precipitate deficiency crises that otherwise would remain latent.

Not only does the energy consumed influence the requirements for specific nutrients but, the diversity of food consumed from day to day likewise is a factor. In experimental studies both with animals and human subjects, standard constant diets have been used both as to kinds of food and quantity. Holt (*Federation Proc.* 3:174, Sept. 1944.) says:

> It is reasonable to expect that requirements of thiamine would be lower on a diet which is constant—meal after meal—both in respect to calorigenic foods and thiamine content —than on a diet which may at times provide an excess and at other times a deficiency of thiamine.

The continual change in food variety under practical daily diets may affect the intestinal flora and may increase our need for certain factors, or again, it may affect physiologic utilization of such factors. Test balance-studies have shown the necessity for preliminary periods on test items to allow for physiologic adjustment in order to obtain reliable balance data.

It would appear that a high caloric intake of an unbalanced diet producing a

"well-satisfied" feeling on the part of the consumer may be insidious in its action in that its significance may be more readily overlooked than that of the lower calorie diet which leaves the consumer hungry. Is it possible that the lessening of certain disease rates during war-time diet restrictions or on experimental or other suboptimal diets may be influenced thereby? Is this one of the reasons that overweight is a dangerous condition increasing susceptibility to a number of diseases? Is it better to be calorically undernourished unless one is sure that all essential nutrients are well supplied?

In summarization of the discussion of the statement that "all vitamins should be obtained from the grocery store" it has been pointed out that even when the choice of food-combinations is originally satisfactory, the diet may be rendered unsatisfactory by the destruction or loss of nutrients in storage, cooking, serving, or, by the inclusion of disproportionate amounts of vitamin-deficient or poor foods such as refined cereals, sugar, candy, cake, alcoholic or sweetened carbonated beverages. Therefore, although ideally all necessary food essentials except vitamin D should be obtained from foods, there are instances in which sound information by the physician and dentist about the role of commercial vitamins can be an important factor in maintaining the patient's health.

Dr. Jolliffe has said:

> Practicality dictates that the physician [and dentist] prescribe supplementary vitamins whenever a patient is not regularly consuming a satisfactory diet. Some patients may sincerely try to eat a satisfactory diet but fail because of business, working or home conditions, or for other reasons beyond their control. Others will not eat a satisfactory diet because of habits, fads, or fancies, lack of necessary information, or sheer obstinacy. Even though an unsatisfactory diet may be lacking in other essentials than vitamins alone, for those who do not or cannot regularly consume a satisfactory diet, a proper vitamin supplement is indicated. While this is not as good as a completely satisfactory diet, it is the next best thing. Some authorities apparently feel that a vitamin supplement may conflict with obtaining the best possible dietary. This is not necessarily or even usually true. It should be noted that the increase in vitamin sales between 1939 and 1944 coincided with, and did not prevent, a decided improvement in the per capita American diet. It may be that vitamin supplements call to the attention of their users, the importance of a satisfactory diet. (*J.A.M.A.* 129:614, Oct. 1945.)

DIFFERENCE BETWEEN SUPPLEMENTARY AND THERAPEUTIC DOSES

Vitamin products may be given either as supplementary or therapeutic doses. Supplementary doses are those which, in recommended daily doses provide amounts of specific nutrients to insure intakes approximating the allowances as set by the National Research Council. Therapeutic doses provide levels from three to five or even ten or more times the daily needs. They are of value in treatment of recognized or suspected deficiency disease. It is possible for doses of vitamins within supplementary levels to have therapeutic value and yet lesions due to chronic vitamin deficiencies cannot be expected to respond favorably in a reasonable period of time to supplementary doses. The failure of expected thera-

peutic action of supplementary vitamins has caused many lay and scientific persons to attack indiscriminately the use of all vitamins.

INDICATIONS FOR USE OF SUPPLEMENTARY VITAMIN FORMULAS

Supplementary vitamin formulas are of benefit whenever a person is not regularly consuming a satisfactory diet. Such instances are listed by Jolliffe:

1. TO SUPPLEMENT:
   (a) An unsatisfactory diet in the part of the general population that will not or cannot eat a satisfactory diet, or for those whose diets do not appear to be satisfactory.
   (b) Restricted diets, as in obesity, diabetes, gall bladder disease, peptic ulcer and food allergy or during illness, infections or some surgical conditions and in convalescence.
   (c) Special diets for food faddists.
   (d) Infant feeding.
2. For persons known to have an increased vitamin requirement, as during hyperthyroidism, pregnancy, lactation, fevers, delirium or during periods of unusual physical exertion.

To the above one might add another group—habitual users of certain drugs: for example, salicylates increase the urinary excretion of ascorbic acid and thiamine, but it is probably more important that they interfere with the formation of prothrombin from vitamin K. "This action of salicylates" say Keys and Mickelsen (*Federation Proc.* 3:209, Sept. 1944), "is potentially important because of their extensive use in diseases characterized by a long course or slow convalescence such as rheumatic fever, arthritis, malaria, and gout." Treatment with sulfa or other drugs may also result in vitamin deficiencies.

For those persons included in one of the above categories it may be worth-while to play safe by supplementing the diet while at the same time endeavoring to eat as good a diet as possible. After all, much still needs to be discovered about vitamins so that "drug store vitamins" may not supply all items necessary to good health.

INDICATIONS FOR PRESCRIBING THERAPEUTIC LEVELS OF VITAMINS

Whereas supplementary levels of vitamins are given to prevent changes due to deficiency of the nutrients, therapeutic levels are of use in the treatment of disease manifestations. In an article prepared at the request of the Council of Foods and Nutrition of the American Medical Association, Dr. Norman Jolliffe discusses this subject as follows: (*J.A.M.A.* 129:614, Oct. 1945).

Adequate nutritive therapy does not consist in giving only the nutrients in which a deficiency is clinically manifest. It is now known that most deficiency states involve multiple factors, and deficiencies clinically evident are usually associated with additional tissue deficiencies of nutrients not yet clinically manifest. Adequate therapy of a deficiency disease, therefore, requires not only sufficient administration of the specific nutrient long enough to obtain maximum reversal of the manifest lesion but also, in addition, the restoration of tissue normal in all the essential nutrients. This can best be accomplished by a judicious combination of diet, a source of the whole vitamin B complex, the essential vitamins (vitamin A, D, B_1, B_2, C, and niacin amide) and specific therapy. A good diet means a full nutritious, protein rich diet including natural unre-

fined foods administered within the tolerance of the patient. The good diet is essential, for it contains, along with known nutrients, unknown factors which cannot yet be encapsulated or dispensed in drops, ampules or tablets. In addition, the prescription of an adequate diet is a means of educating the patient of its value in the hope that he will continue it when other therapy is discontinued.

The entire B complex is given, preferably in the form of brewer's yeast, brewer's yeast extracts or crude extracts of whole liver, liver concentrates or desiccated liver, wheat germ or rice-bran extracts. These are not given primarily because of their content of thiamine, niacin and riboflavin but rather as a source of other B complex nutrients not yet synthesized, thus supplementing these factors as found in the full diet. Many conscientious physicians have been lulled into the belief that a dose of several milligrams of a yeast or liver fraction fortified with synthetic vitamins, in a capsule or a pleasantly flavored syrup or elixir constitutes adequate B complex therapy. Liver and yeast products should be administered in grams and ounces rather than in grains and milligrams.

A preparation containing large amounts of the fat and water-soluble essential vitamins is also given, as almost every manifest deficiency is associated with a multiple tissue deficiency of these vitamins. A practical formula is one containing vitamin A 25,000 units, vitamin D 1000 units, thiamine 5 mg., riboflavin 5 mg., niacin amide 150 mg. and ascorbic acid 150 mg. The administration of this formula twice daily for a week or ten days is effectual in helping to restore normal tissue levels of these essential vitamins. After this period, administration once a day is usually sufficient.

To this basic therapy of diet, vitamin B complex, and essential vitamins, are added the specific chemicals indicated by the manifest nutritional diseases. Thus, if there are lesions of vitamin A deficiency, 50,000 to 150,000 I.U. of vitamin A is given. Similarly, for their specific lesions, 10 to 20 mg. of thiamine, 5 to 15 mg. of riboflavin, 100 to 1000 mg. of niacin amide and 100 to 1000 mg. of ascorbic acid are prescribed. In acute deficiency disease this treatment may be required only for days or weeks; for chronic deficiency disease treatment may be required for much longer periods.

There is no known difference between synthetic and natural vitamins. Natural foods or crude concentrates may contain substances other than the known vitamins and are given for that reason; but when a specific factor such as thiamine, niacin amide, ascorbic acid or other synthesized chemical is given, it is the same whether made by nature or man.

SUPPLEMENTARY AND THERAPEUTIC PRESCRIPTIONS FOR ORAL LESIONS

Since certain oral lesions are suggestive of nutritional deficiencies, dentists have occasion to prescribe vitamins. This prescription should be given only in conjunction with local treatment of symptoms and along with specific advice as to a satisfactory diet. The number and size of servings to be recommended from each of the food groups has been discussed in Article II of this series (April, 1945).

Supplementary vitamins should be recommended whenever dental patients are not regularly consuming a satisfactory diet as indicated by dietary records, history and clinical findings. They are probably advisable also when patients must depend upon large scale cookery for the majority of their meals, and thus have no control over the preparation of the foods, and only a limited control in selection. If citrus foods or tomatoes are available daily, a fish-oil preparation supplying vitamins A and D, and another preparation furnishing the B complex vitamins should be sufficient. The availability of supplementary vitamins should not be interpreted to mean that we can be careless in our eating habits expecting

to make up for any deficiencies by taking pills. However, study of the effects of present habits of living suggests that for many it is well to play safe by adding commercial vitamins. Yet even so, vitamin concentrates are used properly only as a supplement to efforts at establishing sound dietary habits and an intake of a varied diet of natural foods properly prepared.

Trial use of vitamin *therapy* is indicated in patients having objective symptoms which could be due to a deficiency state. Unfortunately specific data are limited as regards oral symptoms and tests for deficiencies. Available research on the subject has been reviewed in previous articles of this series. From this it can be seen that decision to use supplementary or therapeutic vitamin dosage depends on intelligent guesses and "trial" tests. Fortunately no ill effects from vitamin dosages in amounts generally recommended and used have been reported. As most deficiency states involve multiple factors a basic multiple vitamin prescription is probably always advisable. To this, trial doses of individual vitamins as suggested may be added to observe response of tissue signs.

SUSPECTED VITAMIN C DEFICIENCY:

Suggestive tissue signs: Cyanotic gingivae, edematous interdental papillae, spontaneous hemorrhage.

Dosage: 300 mg. ascorbic acid daily in 3 divided doses with meals.

Tissue response expected in 4 to 14 days, then maintain with 50 to 100 mg. daily.

SUSPECTED NICOTINIC ACID (NIACIN) DEFICIENCY:

Suggestive tissue signs: Bright red or enlarged papillae of tongue, sensitive or burning tongue, occasionally atrophy of papillae, multiple fissuring, tooth indentation along margins of tongue; red gingivitis; red stomatitis.

Dosage: 300 mg. niacinamide in 3 divided doses with meals.

Tissue response expected initially in 5 to 7 days—continue dosage for one month or reduce to 100 mg. daily depending upon progress of case.

SUSPECTED RIBOFLAVIN DEFICIENCY:

Suggestive tissue signs: Bluish or magenta enlarged tongue; cheilitis; cracked, scaly lips.

Dosage: 15 mg. daily in 3 divided doses with meals; drop to 5 mg. after one month or according to tissue response.

SUSPECTED VITAMIN D DEFICIENCY:

Suggestive tissue signs: Alveoloclasia, porous jaw bone structure (intake of calcium, phosphorus and vitamin C must be considered in conjunction).

Dosage: 600 to 1000 I.U. as a fish oil daily in conjunction with 2 or 3 glasses of milk or equivalents in dicalcium phosphate. Continue so long as patient does not get regular exposure to clear sunshine.

SUSPECTED VITAMIN A DEFICIENCY: There is relatively little evidence for oral tissue therapy. Deficiency may be suspected if oral tissues not normally keratinized (such as are the gingivae) become keratinized. When vitamin D is taken, vitamin A is usually supplied in the same source.

There is very little evidence at this time as to the need for continuing large dosages of vitamins over long periods.

VITAMIN TOXICITY

"Vitamins in reasonable dosage have no toxic effect so that no harm is done by their indiscriminate use" (Gordon and Sevringhaus. *Vitamin Therapy in General Practice*. Year Bk. Pub. Chicago, 1940, p. 17).

Vitamin D is the only vitamin from which clinical intoxication seems to be even a remote possibility. The toxic dose appears to be in the region of 20,000 I. U. per kg. body weight or nearly one and one-half million units daily for a man weighing 70 kg. (p. 129).

Many are concerned about the possibility of harm which may be brought about by unbalanced dosing when individual vitamins are given. Harris and Thimann (*Vitamins and Hormones,* N. Y. Academic Press, 1945, Vol. 3, p. 15) state that in experiments with animals, unbalanced dosing with moderate superfluity of certain vitamins has little effect. The main issue then is probably not toxicity or harmfulness in the use of commercial preparations but rather, at times wastefulness.

CONCLUSION

The well-informed nutritionist can at present recommend "trial" use only of vitamin therapy in each individual case. Even though a real difference exists in group studies, this cannot be interpreted that all of the subjects in the group were benefited equally by additional intake of essential food factors.

Dentists must understand the importance of vitamins, but they also have a responsibility to prevent patients from becoming victims of needless and expensive vitamin use. On the other hand, no remedy should be left untried when oral health is at stake. In all cases vitamins should be used only as a supplement to local treatment and to establishment of good dietary habits. It was aptly stated in a recent cartoon: "I recommend that you supplement these vitamin pills with three well-selected meals daily."

(Continued in the July, 1946 issue.)

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Periodontia Case Recording

By ISADOR HIRSCHFELD, D.D.S., F.A.A.P., *New York, N. Y.*

RELIABLE records are an indispensable phase in the routine of one's practice, general or specialized. In periodontia, this is especially important because of the complex nature of the etiology of the abnormalities the dentist is called upon to diagnose and treat. Prevention of recurrence, too, requires circumspection and a thorough knowledge of the history and past treatment.

Furthermore, it is assumed that the average periodontist is also a periodontologist, for in order to be increasingly successful, he must continue to enrich his knowledge in the science and art of his specialty, through his colleagues' efforts, and from his own experience. This he may build up partly through meticulous recording and through it, he, in turn, may help his colleagues to promote the efficacy of their chosen health service.

In periodontia practice, the recording most often consists of two parts, the medical background and the presenting periodontal abnormalities. Thus, one has to note systemic conditions that may play or may have played a part in the etiology, or influenced the clinical appearance of, the periodontal picture, or even may act as a deterrent in its treatment; these may be, for instance, nutritional deficiencies, endocrine or metabolic disturbances, blood dyscrasias or such debilitating diseases as syphilis and diabetes. On the other hand, the periodontal (as well as dental) abnormalities such as gingival hypertrophy or atrophy, gingival or alveolar destruction, periodontal pocket-suppuration, tooth drifting or mobility, food impaction, etc., should be carefully noted, not only as an aid in treatment but also for the purpose of future comparison.

The essential means of case recording are: 1. The examination chart (1), 2. Roentgenographic series, 3. Casts (2), and 4. Pho-

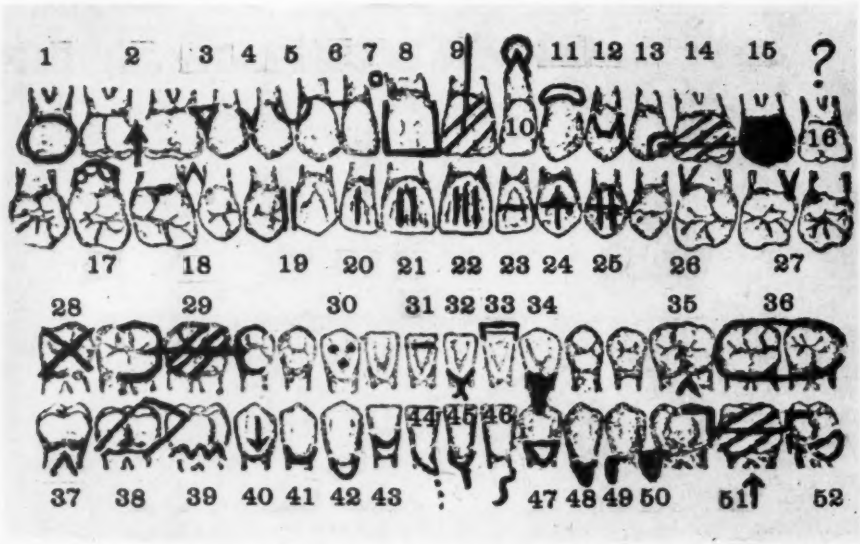

Fig. 1. Chart of diagrammatic symbols reproduced from "Diagrammatic Recording of Periodontal Disease". (1). The numbers opposite the characters represent the respective numbers in the text.

tography. Experience has proved that of these, the first three are *musts*, while the last is highly desirable even if only for the operator's personal satisfaction; besides, the patient, too, may at a later date be highly pleased and reassured with the obvious results during or after completion of treatment, as measured by comparison with photographs (color or black and white) which the lay person can evaluate better than either the casts or charts.

The examination chart is by far the most valuable form of recording from whatever angle (private practice, research, teaching or publication) one may view it, and therefore, the more nearly complete it is in all its details, the more satisfactory. For this reason, I have developed a diagrammatic code (Fig. 1) which I have found increasingly useful since some time before its publication about 15 years ago, and which may be advantageously supplemented by a few additional symbols.

These diagrammatic symbols may be recorded in the course of the examination on a small dental chart (purchasable at the dental dealers), that may be attached to the napkin at each treatment, as depicted in Fig. 2; it is more practical than a large cumbersome document that may have to be manipulated with both hands several times during a single treatment. On the reverse side of this chart (Fig. 3) are recorded only the most important case history items pertinent to the individual patient. This simple record is, to my mind, very practical for the average periodontist, although a more comprehensive medical history such as used by the American Board of Periodontology[1], may be desirable in special instances.

In my practice, recording of the following abnormalities on the chart has proved extremely valuable in most cases. I recommend their routine use. Failure to do so may result in incomplete treatment with consequent embarrassment to the dentist. Furthermore, he may be deprived of definite evidence of the degree of his success in treatment, and consequently of confidence in his ability, which is so important in the successful treatment of periodontal disease.

The abnormalities listed below are accompanied by the numbers indicating the respective diagrammatic symbols in Fig. 1:

gingival recession, 44
loss of septal gingiva (punched out as in Vincent's infection), 18
interproximal hypertrophy, 5
periodontal pockets, 34, 35, 36 and 51
involvement of bifurcations, 26, 27, 37, 39
loss of approximal contact, 19
food impaction, 2
degrees of mobility, 20 to 25 incl.
fistula, 7
periapical radiolucency, 10
questionable prognosis, 16
tooth to be extracted, 28
missing teeth, 1, 38
pontics (fixed 14, removable 52)
porcelain jacket, 12
gold crown, 15

This brief presentation does not permit detailed explanation of the various ways in which the diagrammatic recording has been of value, but the following examples may serve to stress its importance:

Patients may be worried during or some time after treatment, by the suspicion of an acquired or markedly increased, mobility of teeth or by their failure to become tighter; similarly, the formation of interdental spaces through drifting. The question of mobility can be very definitely and quickly solved to the patient's entire satisfaction, by re-charting the mobility of the specific teeth without looking even once at the original chart. When the patient is shown the two charts for comparison, and the results indicate that not only are the teeth not looser but even tighter than before treatment, he is grateful and appreciates the meticulous recording at the time of examination, as well as the obvious successful results.

A patient who had forgotten the presence of interdental spacing before treatment may be suddenly surprised by it in the mirror. She is pleased to find that on the chart such spacing had been previously recorded. In this instance, however, record casts are even more satisfactory because it is possible not only to prove the previous existence of interdental spaces, but also the extent to

[1] *See J. Periodont.* 17 (1):36. Jan. 1946

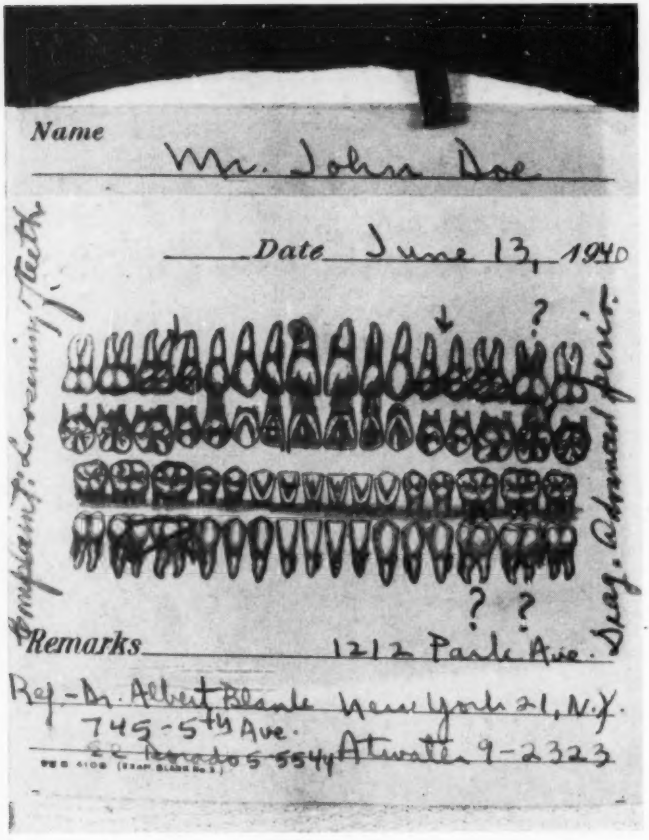

Fig. 2. A practical record chart readily attached to the patient's napkin; it serves not only as a diagrammatic record of the periodontal abnormalities, but also as an operation guide. The dental chart is printed in red, and the names, addresses and the date are written in black ink, but the recording is all done with lead pencil to facilitate the marking, as well as erasing when necessary. The chief complaint is written on the right side of the chart and the diagnosis on the left. Note the Scotch tape placed over the upper edge of the chart to protect it from tearing by the repeated use of the napkin clamp. For reverse side, see Fig. 3.

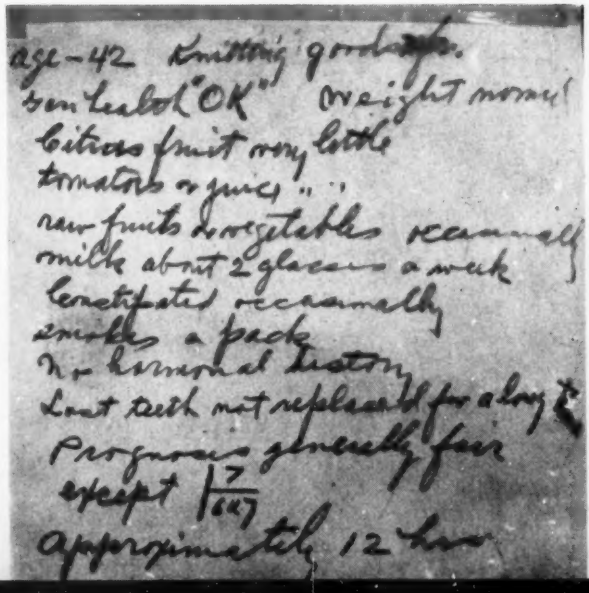

Fig. 3. Reverse side of the record chart shown in Fig. 2. On it, are usually noted any medical or dental history, or habits that may be significant; also the prognosis and the approximate time for treatment, and its cost and possibly the payment arrangement. Any longer or more detailed medical history is included on a separate page together with notes on mouth hygiene habits. For practice purposes, this type of recording seems quite ample in the average case.

which the teeth actually have returned toward their normal positions.

Patients are frequently elated to note that teeth that were marked questionable on the chart have become healthy and continue to function normally many years later. On the other hand, should a tooth originally marked "questionable," several years later require extraction, the dentist is saved embarrassment, by the question marks recorded on the chart as a reminder that the patient had been forewarned that sooner or later that tooth may have to be extracted. For this reason, it is advisable routinely to warn the patient of questionable prognoses at the time of examination, and the question mark acts as a definite reminder of such warning.

The symbol "X", indicating extraction of a tooth has, on a number of occasions, proved of real mental comfort to the operator. Sometimes the patient, for one reason or other, prefers to procrastinate the extraction. On the other hand, it is often advisable to permit teeth that are eventually to be extracted, to be retained, until the savable teeth are made well; this may be expedient in certain cases because the doomed teeth may meanwhile help prevent excessive occlusal stress, which might hinder successful treatment. When such teeth are temporarily retained, one is often tempted to improve their periodontal health to hasten recovery of the adjacent teeth. In some such instances, the patient later forgets that these teeth (which had meanwhile been made to feel and function comfortably) were to be retained only temporarily. Instead of appreciating the dentist's beneficial circumspection, he is likely to claim disappointedly that "the treatment has not been generally successful, since after all, some of the teeth do have to be extracted." When the patient is confronted with the extraction marks on the chart, he is very easily reminded of the original prognosis and the operator is saved embarrassment.

And so, one might continue to give numerous additional reasons why the recording of most of the elements contained in the chart is important not only as an invaluable aid in periodontia practice, but, as earlier stated, for clinical research and publication purposes.

REFERENCES

1. Hirschfeld, Isador: "Diagrammatic Recording of Periodontal Disease," *J.A.D.A.*, 18(10):1927-1943. Oct. 1931.
2. Hirschfeld, Isador: "Importance of Casts in Periodontia Practice," *J.A.D.A.*, 20(7). July, 1933.

730 Fifth Avenue

In Memoriam

R. HOLMES MASON

March 29, 1946

Editorials

Opportunities for Women Dentists

NOW THAT there is an urgent demand for more dentists, dental schools and other agencies are scanning the field to discover new recruits for dentistry. A recent bulletin has been prepared and published by the Department of Labor Relations. It describes the opportunities for women in dentistry and emphasizes those for women dentists.

Lucy Hobbs Taylor was the first woman in the world to be graduated from a dental college—the Ohio College of Dental Surgery in Cincinnati, Ohio, Feb. 21, 1866. According to Dr. Jonathan Taft, then Dean of that college, "She was a woman of great energy and perseverance, studious in her habits and had the respect of every member of her class and of the faculty. As an operator she was not surpassed by her associates. . . . In the final examinations she had no superior." Dr. Taylor was active in dental and patriotic organizations.

About this time there was much discussion about women entering the dental profession. Their cause was championed by Dr. James Truman of the Pennsylvania College of Dental Surgery from which institution the second woman dentist to be graduated, received her degree. Women dentists were not eligible to membership in the American Dental Association at that time although some sectional and state societies admitted them as members. In 1870 there were twenty-four women dentists. At the present time there are approximately 1,000—not much of an increase in seventy-six years. In the late 1920s, 60% of the dentists in Finland were women.

In 1940 there were four dental schools in the United States where women were not admitted. There were other schools where they were advised to take the dental hygienists' course instead of the regular course in dentistry. In fact it was tending toward a general policy to discourage women matriculants in dental schools. In one instance, a young woman, graduate of a Junior College, who had a dentist-father and grandfather, a pleasing personality, and much enthusiasm about the prospect of studying dentistry, was discouraged by all but one of the dental school faculty where she asked for information. It was only her deep desire and determination to become a dentist that persuaded her against their will and she was later graduated with credit to herself and to the school.

The proportion of successful women dentists is fully equal to the proportion of successful men dentists. Women have naturally many of the qualifications desirable in a dentist. Many of the early pioneer women dentists were outstandingly successful in practice and made specific contributions to dentistry. The same may be said of contemporary women dentists. Two are authors of books, one a text-book, some are on dental school faculties and on hospital and other institutional staffs, several have established dental clinics, others are researchers, clinicians, and public health workers. A few are interested in dental journalism. Most women dentists prefer the general practice of dentistry, but a considerable number are periodontists, orthodontists and pedodontists. A number are active in dental organizations and have held acceptably the most responsible offices.

This is an evidence of the respect they have earned from their confreres.

A more encouraging attitude toward young women applicants for dentistry by dental school faculties would naturally increase the number of women who would study dentistry and would lessen the difficulties during training for those courageous enough to attempt it.

To be successful in dentistry a woman must do better work than the average done by men doing the same type of work in order to balance the prejudice that still exists when women do what is considered specifically men's prerogative.

One of the most justly criticized faults of dentistry as it is practiced is the limited attention paid to the teeth of children. If there were more women urged to study dentistry and especially trained to appreciate the opportunities in pedodontia for service, one of our most serious problems would be nearer solution.

—G. R. S.

Further Comments on Dental Problems

ON THE one side of pressing dental problems we are concerned with a change in dental education which demands that greater emphasis be placed on the biological and medical sciences, even, as some advise, to the extent of requiring a medical degree for graduation in dentistry, with the inevitable lessening of hours required for technical training, and a consequent lowering of respect for things done by the dentist's own hands. This course seems inconsistent with present demands for more dentists, for the plan just mentioned would lessen the number of graduates. On the other side we are becoming increasingly aware of a growing *demand* for dental services, and the need for various efforts to increase the number of dental students, hoping in this way to soon increase the number of dentists.

As we hop and skip mentally from one problem to another it is to be hoped that we will avoid the solution, which appears now to be a trend only, to delegate to auxiliary personnel, important procedures that can be satisfactorily done only by graduates of dentistry. If we should jump into socialized dentistry, it will be inevitable that auxiliary personnel will be used to an extreme degree because of the limited number of dentists available and the length of time required for their training. The same result will follow if dentists are educated to the point where they are no longer willing to use their hands regularly in the practice of dentistry. Leaving out of discussion the necessity for highly educated researchers and diagnosticians, good dentistry so far as the patient is concerned, depends not alone on thorough education in the sciences, but also on skillful, considerate, and intelligent operations on the teeth in the patient's mouth.

When we have reached decisions about our many problems, it is to be hoped that we will move in one direction only—towards better dentistry for more people. This objective would include emphasis on skill in operations on the teeth with double emphasis on prevention, extensive education of the public in *personal* responsibility regarding health, both general and oral, and finally, a full realization of the value of the natural teeth in a clean and healthy environment.

—G. R. S.

In Our Opinion

THE OCCLUSAL FACTOR IN PERIODONTAL DISEASE

Initial Statement

By HAROLD J. LEONARD, D.D.S., B.A., *New York 32, N. Y.*

THE tooth is suspended in its socket and braced against lateral movement by the fibers of the periodontal membrane. The lamina dura is a shell of cortical bone for the attachment of the suspensory fibers. It in turn is supported against stresses by the bony trabeculae of the surrounding cancellous bone. The fibers of the periodontal membrane and the trabeculae of supporting bone are numerous and dense when function stimulates growth, diminished or absent where there is no function. At the time the teeth erupt the various forces acting on them under conditions of good health and vigorous function, tend to direct them so that they form an excellent masticating machine. Such a machine has the maximum number of points of occlusal contact in all of the articular positions and no interferences with articular movements. The tooth supporting structures and the forces are in equilibrium, the teeth are stable and barring accidents are not subjected to injurious stresses.

Many conditions lead to the development of injurious stresses. Injurious stresses are repeated physical movements of the tooth in its socket so extensive as to stretch and tear the periodontal fibers on the tension side, while crushing the periodontal tissue between tooth and alveolar wall on the compression side. If the compression is severe portions of the periodontal tissue will be devitalized along with adjacent lamina dura. Such a necrotic tissue will be removed by giant cells after a time and will become reorganized, providing the injury is not repeated and bacterial invasion does not interfere. If the crushing injury is not so severe and the crushed tissue is not killed but only injured, an inflammatory hyperemia is induced which causes solution of adjacent lamina dura and softening of the periodontal fibers. Repeated insults lead to a degenerative metamorphosis of the periodontal membrane with grave vascular changes. Such changes open the way for epithelial penetration along the root at the expense of the periodontal membrane and also to deep penetrating bacterial invasions and destruction of periodontal attachment.

The causes of occlusal traumatic stresses are changes in the forces which hold the teeth in equilibrium. The loss of a posterior tooth removes the contact support from adjacent teeth and submits these teeth to mesiodistal movements against which they have not built a sufficient resistance. A habit of clenching the teeth during sleep, or pushing against the teeth with tongue or lips will cause the teeth to shift in their positions and often get into malrelation with the other teeth. A habit of chewing with but little lateral motion results in unworn

balancing cusps which tend to lock the bite more and more and in turn bring great buccolingual stresses on those teeth whose cusps interfere the most with lateral articular excursions. Malocclusions due to any cause tend to become traumatic with time because nonfunctioning teeth or portions of teeth extrude and fail to wear while functioning surfaces do wear. The nonfunctioning teeth and surfaces grow relatively longer and develop interferences to masticatory movements. Biting on finger nails, threads, or pipe may cause injuries which in the absence of a vigorous functional blood supply may lead to destructive disease. Swelling of periodontal tissues due to abscess, tumor, or deep periodontoclasia will cause teeth to shift position or extrude and get into positions where they may interfere with masticatory movements. Improperly made fillings, bridges and dentures may create interferences and clasps may wrench the teeth upon insertion and removal.

The detection of occlusal trauma is usually not difficult. Thickening of the periodontal line or the lamina dura line in the roentgenogram on mesial and distal sides of the tooth indicates excessive mesiodistal movement. Mesiodistal stress should always be suspected when contact support for posterior teeth is lacking. Periapical thickening not due to pulpal disease indicates excessive intrusive stress. Mobility is an indication of occlusal interference although periodontal inflammation may also cause it. Sighting along the teeth while the patient articulates under biting pressure will often detect occlusal thrusts which are injurious even though other symptoms may not have developed. Such thrusts may also be felt by placing the fingers over two or three teeth at a time.

Where stresses are introduced suddenly as by the insertion of an overhigh filling or crown the periapical irritation may involve the pulp to create symptoms of pulp hyperemia, pulpitis and even pulp death. Such a tooth is usually tender to biting pressure and percussion so that it can be localized. Periodontal abscess is a frequent effect of deeply penetrating periodontal infection, the result of lateral stress. Vascular disturbance of the overlying gingiva and deep pocket formation in the absence of irritating debris often indicates mechanical irritation. Acute soreness of the base of the gingival sulcus or pocket to gentle probing is often a symptom of occlusal trauma although chronic Vincent's infection will also cause this symptom. Periodontal pockets which refuse to heal when debris is removed and gingival massage instituted will often be found to be due to traumatic occlusal irritation which prevents the restoration of a normal vascular bed.

The treatment of traumatic occlusion should be directed first to relief of excessive stress on traumatized teeth and second to mouth rehabilitation procedures, which create favorable mechanical relations, thus preventing movements of teeth during occlusal articulation and offsetting any tendency to further shifting of teeth.

The relief of excessive stress on traumatized teeth may need to wait on a rehabilitation procedure. Traumatic stresses can hardly be removed from a few remaining loosened anterior teeth until the posterior portion of the dentition is

built up with dentures. So far as practicable the adjustment of occlusion by grinding should await any procedures that build up the mouth and bite especially if vertical dimension is to be increased.

The adjustment of the occlusion by grinding should, in my opinion, be approached very conservatively. It is far better to adjust the occlusion a little at a time over a series of visits, only doing what is necessary to eliminate traumatic thrusts, rather than to change the occlusal relations markedly at one visit in the attempt to approach an abstract ideal. The ideal, of course, is a maximum number of occlusal points of contact in all the excursive movements of the jaws. In many dentitions an attempt to grind to such an ideal would involve cutting into the dentin in many teeth and a lowering of the occlusal levels, thus decreasing vertical dimension. Where this has been done patients are sometimes very unhappy about it. The sudden change involving newly exposed dentin, new directions of stress on the teeth, crowding of the tongue, a loss of habitual relation between occlusal surface levels and length of muscles of mastication, difficulty in speech and difficulty in swallowing causes great annoyance. In a neurotic patient such a disturbance may lead to an obsession.

The grinding should be in the direction of restoring the normal curves and contours of the dental arches. Rotated teeth with corners standing out to interfere should have the corners ground down to level. Long upper buccal cusps and lower lingual cusps should be ground where they interfere so as to free the bite for easy lateral excursion and to restore the lateral occlusal curvature. Extruded teeth should be ground to level even though this may involve an occlusal restoration to protect exposed dentin. If the extrusion is too great for this procedure extraction may be indicated. The curve of Spee should be reëstablished if this is possible in the course of occlusal adjustment. If teeth are irregular in front and but one or two traumatized teeth are in contact in the protrusive occlusion, then incisal grinding should be instituted on extruded teeth so that at least four upper anteriors meet four lowers in the protrusive position.

If the upper incisors are given a thrust when the jaw is brought into centric occlusion, it indicates that the lower incisors are too long for the existing vertical dimension. If vertical dimension is not to be increased then the lower incisors should be shortened just to a level where they do not create such a thrust. On the other hand, if there is no thrust of the upper incisors when the teeth are occluded in centric position, but there is interference indicated by labial thrust when the jaw is moved in lateral excursions, it indicates that the lingual surface of the upper incisors is not properly adjusted and needs to be ground to give room for excursion. Such grinding should not include the points of occlusal contact in the centric position.

The same principle applies when adjusting occlusion on posterior teeth. The occlusal contact points of centric position should not be ground unless there is evidence that a tooth gets a thrust when the jaw closes in the centric position. Where the thrust occurs during lateral excursive movements, the grinding should

be on the areas of interference—mostly on the occlusal cuspal planes of the upper buccal and lower lingual cusps.

When teeth are ground the tendency is to form large surfaces of occlusal contact. Such surfaces bring strain on the periodontal membranes and bone support of affected teeth, because food gets crushed and packed between these opposing occlusal areas and cannot escape. The full weight of masticating muscles is thus brought to bear on one or two teeth. Cuspal surfaces should be rounded and sluiceways should be ground into the occlusal surface so that food will not be packed, but rather squeezed out from between the occluding teeth. It is also good practice to round the buccal and lingual surfaces so as to make the occlusal surface narrow on teeth with weakened support.

Black soft wax may be pasted over the dried occlusal surface to be ground. The patient then bites through the wax and moves the jaws in lateral excursions. Examination then reveals where and how the wax is cut through. Better information as to how best to grind can often be obtained by this method than by the use of articulating paper.

Ligating with stainless steel wire is sometimes helpful in temporarily supporting loose teeth while healing is taking place. If the wiring can be done so as to prevent further extrusion while the periodontal tissues are re-forming it may be very advantageous. Care must be taken that teeth ligated together are not interfering anywhere with occlusal movements, for otherwise all the teeth included in the ligation will be loosened. Ligating wire is particularly useful for supporting and drawing back into line a row of protruded, separated, anterior upper teeth after the bite has been opened sufficiently by posterior replacements, so that there is room for such movement. This is a form of orthodontics which the periodontist may easily perform with great satisfaction to himself and his patient, in many cases where upper anteriors have been protruded due to loss of posterior support.

Posterior teeth which do not have tight proximal contact should have restorations to supply it even though it involves cavity preparation in sound teeth. Otherwise food impaction leads to periodontoclasia and root surface caries and loss of support permits injurious mesiodistal motion. If the teeth adjacent to a space are tilted into the space then the teeth should be supported by a fixed bridge. This may consist of two inlays soldered together at the contact point if there is insufficient room for a pontic. The bridge should be fastened at both ends and not depend on a lug in a lug seat at one end. This may in some instances involve extensive cutting to obtain parallel cavity preparations or supplementary fillings to cover receded proximal surfaces. Those steps are required because of the necessity for stabilization. A tooth tilted mesially is continually moved in the mesial direction unless it is fixed to the tooth mesial to it. Even a cantilever arrangement in which the fore end is supported by a lug in a lug seat fails to give sufficient stabilization to permit the tilted tooth to become firm in its socket.

Buccolingual mobility is offset by an appliance that ties the two sides of the

arch together, a rigid partial denture harness with nonflexible clasps for the weak teeth. Judicious grinding is ordinarily sufficient to offset buccolingual motion when all teeth are present. When some are missing and a partial denture of some sort is indicated, the choice as to fixed bridgework or clasp denture may well depend on whether it is mesiodistal or buccolingual support that is needed. Fixed bridgework is of very little help in support against buccolingual motion. On the other hand a clasp denture is insufficient support to offset mesiodistal motion on teeth tilted toward mesial or distal. The modern laboratory technic of making partial dentures, using some of the new cobalt chromium alloys for rigid nonflexible harness, and designing clasps so that no lateral stress is offered the clasped teeth on inserting or removing the denture, mark a great advance in partial denture construction. A modern partial denture may be regarded as an important therapeutic agent in periodontoclasia cases of weakened alveolar support and traumatized teeth. It should not be considered a temporary stopgap on the way to full dentures.

Faults in equilibrium which cause injurious stresses on teeth are an extremely important cause of vascular changes of the periodontal structures which lead to periodontoclasia. The diagnosis and treatment of these conditions is often most difficult. Whether or not the operative or prosthetic procedures involved in treatment are rendered by the periodontist, the diagnosis and plan of treatment are definitely his responsibility.

Discussion

C. J. CARABALLO, D.D.S.,
Miami, Florida

The position of teeth and the condition of hard and soft supporting tissues are major factors to be considered in periodontoclasia. If the supporting structures have high resistance, there is often no evidence of destruction from irritation, particularly occlusal stress, or from lack of function. If the resistance is low in the periodontium then the slightest occlusal or other irritation will cause tremendous loss and change in tissue or periodontoclasia. Since the normal does not exist except in print, it must be admitted that malocclusion or traumatic occlusion is present in some degree in every mouth.

To establish and to maintain a high resistance of the hard and soft supporting tissues is of the utmost importance. If the health of all tissues depends upon one's forebears as well as upon one's circulatory and glandular systems, then corrective and preventive measures must necessarily be systemic as well as oral.

The results of any form of treatment depend upon the mouth hygiene habits of the patient. I stress gum massage, particularly interdental stimulation. Proper nutrition, considering the alkaline-acid problem, together with vitamin and hormone therapy are all important and are not infrequently overlooked.

The occlusal factor alone is not responsible for periodontal disease—therefore mechanical equilibrium of the teeth is not enough. *Prevention* of periodontoclasia, whenever possible, is still the solution.

SIDNEY S. FRIEDMAN, D.D.S.,
Memphis 11, Tennessee

Leonard's description of the normal relationship of the tooth to its investing structures and the result of repeated injurious stresses, presents in orderly sequence, the degenerative changes occurring where occlusal forces develop beyond physiologic limits.

The factors mentioned leading to occlusal trauma are comprehensive. Proper emphasis

has been placed on the importance of making a thorough study of existing cuspal relationships before treatment by grinding is attempted. It is obvious that by injudicious occlusal grinding it is possible to further establish imbalances. Also it should be remembered that frequently the changes in position of teeth are caused by a lack of balance between the pressure of the outer ring of muscles of the lips and the thrust of the tongue.

Immobilization of loosened teeth by ligation has not been a satisfactory procedure in my practice. Bracing by interlocking castings has been productive of good results. Much of the extensive cutting mentioned to obtain inter-abutment parallelism in tilted teeth for restorative procedures, can be prevented by the use of adaptors or precision rests.

Leonard's designations for fixed or removable appliances are based on sound engineering principles. Where removable appliances are indicated, it has been my experience that the internal frictional attachment offers a more biologic approach to the problem than does the clasp method of retention. This is especially true where the retention units and the appliance are constructed on a model made from a single master impression. By this method the prepared abutment teeth are registered in their absolute relationship to their investing structures and torsional stresses are reduced to an absolute minimum. The proponents of the muco-static principle, claiming positive stability and retention of claspless partial dentures, may do much to solve the restorative problems of the periodontist.

Observing present day trends in the management of periodontal involvements, one is impressed by the rationale of the several methods of approach as applied to a single case rather than emphasis being placed upon a single therapeutic empiricism. The "Occlusal Factor in Periodontal Disease" should be kept in proper perspective with other possible causes,—never under- or over-emphasized.

CARL W. HOFFER, D.D.S.
Nashville 3, Tennessee

The subject matter was well covered in the "Initial Statement."

The crux of the paper, in my opinion (excluding treatment) are the two conditions of equilibrium.

For an occlusion where normal healthy periodontium exists, the sum of the forces on the teeth is zero and a condition of equilibrium exists.

Where occlusal trauma exists, changes in the forces pertain, that is, changes in their point of application with reference to the basic support. This change in the point of application with reference to the base support introduces torques. And the sum of the torques is not equal to zero, therefore, a condition of equilibrium does not exist.

Elimination of these torques or a considerable reduction in their magnitudes toward zero is the essential treatment of a traumatic occlusion.

ALLISON G. JAMES, D.D.S.
Beverly Hills, California

Dr. Leonard has made an excellent and very comprehensive statement on "The Occlusal Factor in Periodontal Disease" which nevertheless completely fails to present what must be considered to be fundamental. The statement stipulates the occlusal factor in periodontal disease. It is essential to realize that the relation of the tooth to the alveolar process is that of a joint, with all the elements of any other articulation, even to movement, minute though it normally is. Therefore it is correct to speak of the dento-alveolar articulation, and we are dealing with an arthritis. This may be of the hypertrophic type, atrophic type, or possible combinations or transitional stages.

The occlusal factor becomes traumatic only when the supporting bone of the alveolar process is inadequate. Newly erupted teeth show relatively long cusps and deep sulci. In the young, marked movement is observed in the teeth under lateral thrust. As growth continues, the alveolar and cortical bone increases in density, the individual tooth movement becomes more restricted, and the occlusal surfaces of the teeth begin to wear into a smoothly functioning pattern. This occlusal wear may continue throughout a long life to such a degree that in old age the teeth are abraded to the gum line, and with no periodontal disease. If the bone pattern of the individual is inadequate,

occlusal trauma occurs with full eruption of the teeth. The periodontists confronted with a problem of occlusal trauma must recognize that he deals with a case of interrupted normal bone health. The reduction of mechanical stresses through grinding must be regarded as a purely palliative measure and its success dependent upon its relation to the etiology. The vertical atrophy frequently observed in mouths of middle-aged patients, presenting a picture of past vigorous occlusal function and wear, is to be associated with changes in other articulations of the body.

Dr. Leonard has very ably covered the matter of mechanical reduction of stresses, but caution is indicated. Very many years ago I learned from Austin F. James his technic of what he terms "narrowing the wedges." An amazingly slight amount of grinding on the root-ward edge of facets of wear produces the desired result, and with no demonstrable mutilation.

AUSTIN F. JAMES, D.D.S.
Los Angeles 36, California

The phase of Doctor Leonard's "Initial Statement" on which I wish to comment is the grinding of the occlusion for the relief of lateral stress.

I think it can be accomplished without damage to the natural teeth or replacements by eliminating spot grinding and applying the method which follows:

We know that balancing the occlusion by grinding can result in the tightening of the teeth in their sockets and give comfort to the patient. All tooth surfaces are naturally round surfaces until continuous closing causes flat slanted surfaces. By recognizing the symptoms from radiograms we can reduce these disturbances by relief of cusp interference and thus prevent destruction of supporting tissues.

The heavy pressure causing a wedging force or "torque" (as Dr. Andrew J. McDonagh used to call it) produces an injury to all the tissues supporting the tooth. This is called "Traumatic Occlusion." The injury can be relieved by grinding the natural teeth or restorations that have been inserted. Whenever a facet shows on a cusp surface, either upper or lower, it means there has been wear. The flat surface itself is not the danger, but the very edge of the flat surface is what will act as a wedge to the opposing tooth.

First mark the teeth by closing on thick carbon paper. Then by using small stones and rounding up the wide part of the wedge, which has been indicated by the carbon paper, one can relieve the leverage force that twists the opposing tooth. The reshaping being done on the very edge where the enamel and tooth is thickest, there is no danger of mutilating the tooth. Never remove the occlusal carbon marking. In this way there is no closing of the vertical length.

JOHN OPPIE MCCALL, D.D.S.
New York 21, N. Y.

I was glad to have the privilege of reading the "Initial Statement" on the occlusal factor in periodontal disease. My comments are all favorable as I think it is an excellent piece of work and presents a sound viewpoint on this problem. I can make a few suggestions that I think will result in clarification. They are as follows:

On page 1, paragraph 2, sentence 2, I suggest inserting the words "tend to" before *tear*. I do not believe that, in ordinary cases where the traumatic stress has built up gradually through slow changes in occlusal relationships, there is real tearing of fibers. The same point of view might be applied to the matter of "crushing" of fibers. I believe that both tearing and crushing are more likely to be caused by some severe and unaccustomed thrust as when one bites unexpectedly on a piece of bone or nutshell.

It might be well to include a further statement about wear when lateral movement is restricted. In these cases it often happens that wear does take place, but it results not in release from lateral interference, but actual increase of interference because cusps become locked more and more tightly in the sulci of opposing teeth.

In paragraph 5, I think attention should be called to the fact that pulpitis may occur after insertion of a filling or other restoration even when the restoration does not itself directly cause the traumatism. The explanation in those cases is an interfering cusp whose irritating influence had not pre-

viously caused subjective symptoms; the irritations caused by cavity preparation, etc., add to the previous damage and bring on a more severe pulp inflammation. This situation is commonly encountered in the field of pedodontics.

I highly approve your warning conveyed in paragraph 8; however it is desirable to eliminate traumatic thrusts if any grinding is done at all. And this should include relief of "high spots" which often show up on teeth not previously traumatized after the traumatized teeth have been relieved. Failure to reduce these high spots may cause the patient annoyance if nothing more.

Also I suggest adding, a statement that before considering the relief of traumatic stresses as being completed the dentist should satisfy himself, especially by asking the patient, that vertical occlusal pressure is equal on right and left sides when the patient bites in the centric position. Lack of such balance can cause a great deal of discomfort and a possible continuance of traumatic stress on the "heavy" side.

SAMUEL CHARLES MILLER, D.D.S.
New York 19, N. Y.

The "Initial Statement" on "The Occlusal Factor in Periodontal Disease" is very well conceived. The following suggestions are presented as additions rather than criticism:

1. To the statement, "The tooth is suspended in its socket and braced against lateral movement by the fibers of the periodontal membrane," might be added, "and the contiguous teeth" since there is some common stabilizing effect that the teeth give to each other. This support is brought to its maximum by splinting appliances.

2. In the discussion of causes of occlusal trauma, several habit factors are mentioned. In addition, clenching, bruxism and bruxomania are important causes of occlusal trauma and are often the nocuous local factor in psychosomatic disturbances. Unilateral mastication should be given a place in the consideration of habits.

It would be best to mention as well, the negative factors such as nonocclusion, premature wear (naturally or artificially produced) and indolent mastication.

3. The term "chronic Vincent's infection" should be avoided as scientifically unproved. Even the acute variety has never been proved to be due to the Vincent's organisms.

4. In rehabilitation procedures it is true that, when the occlusion is to be completely altered by the restorations, the shaping of the remaining teeth is best delayed until the restorations are in position. However, in all other cases where partial dentures or bite restoration procedures are required, I would prefer to shape the natural teeth as near to balance as possible to act as a guide to the restoration of the missing teeth.

5. The plea for conservatism in grinding is excellent. As for loss of vertical height due to grinding, this need never happen if the rule of confining the grinding to the buccal cusps of the upper posterior teeth and lingual cusps of the lower posterior teeth is followed and the points of centric contact are not disturbed. Excessive grinding will also not be performed if the operator is aware of the relation of cusp height to age and alveolar support.

6. Fixation and splinting effect of stationary and removable restorations has been an invaluable aid to periodontal therapy. The important point in a case plan is to include enough abutments, not hesitating to unite two or three teeth at one or both ends of a stationary bridge to create firm support. With the teachings of Knapp, Kabnick, and their followers, parallelism of as many abutments as needed can be produced without excessive cutting of teeth.

R. W. RULE, D.D.S.
Glendale 3, California

Certainly the occlusal factor in periodontal disease is a very important one, and seemingly, a rather controversial subject. In a given case, if one or many of the teeth are involved either in occlusal overstress or excessive mobility, it becomes a matter for very careful consideration in the outline and procedure of treatment.

It is impossible in the time and space allotted to the subject here, to give a detailed discussion. A few points that have been kept uppermost in mind in dealing with it in practical experience may be set down for consideration.

Suppose a patient in good physiological condition systemically and also locally as to the mandibular and maxillary tissues;—a single tooth or a number of teeth in the arches having medium or longer roots, coming gradually into position or positions of unusual stress, will be sustained against that stress by a compensatory strengthening of the supporting tissues even to the rapid wearing away of the tooth at the point where the stress is applied. Only when the compensatory changes in the supporting structures fail to match the forces applied does the stress become an overstress. Instances are numerous in which teeth have withstood an astonishing amount of force over many years and still remained very firm. But let the physiological condition break down and the situation will change rapidly.

An analysis of this shows that occlusal overstress is not a primary factor in initiating periodontal disease but nevertheless, one to be reckoned with when once the supporting tissues have been weakened through other causes. With this in mind, it becomes a matter of great importance to prophylactically maintain, if possible, both the systemic and local physiological conditions in a vigorous state and to be constantly on the watch for incipient breakdown. Besides this, when stress is found to be heavy, it is well, as a prophylactic measure, to reduce the stress by judicious grinding, or by other means as indicated, such as in a case of overstress in one area occasioned by the loss of one or more teeth in another area.

On the other hand, when the tissues are suddenly subjected to undue stress as in the case of occlusal restorations being left too high, damage to the tissues may result very quickly and relief should be given at once.

When cuspal inclined planes have become worn so as to bring large flat planes into occlusion with each other the stress is greatly increased and these areas should be ground in such a way as to leave them again rounded but not to take them out of functional occlusion. To grind teeth out of occlusion is usually only of very temporary benefit if any at all, for they tend to come right back into occlusion again.

When excessive or even normal wear has had the effect of materially shortening the bite the case offers a difficult problem. If opening the bite one or two millimeters or even more when indicated, is at all feasible in a given case, it becomes possible to restore functional occlusion and to regulate stresses much more effectively than otherwise. In all occlusal restorations made with gold, it is important not to use too hard a gold since wear then becomes uneven and teeth with such restorations and the opposing ones come into too heavy occlusion.

In advanced conditions of periodontal disease a few, or many of the teeth may be found to have marked mobility, and often to be more or less extruded from their sockets. Here, grinding should not be done as an initial measure. Thorough, conservative treatment of the roots and pockets will be followed promptly by a reduction of the inflammatory process and the teeth will settle back into their sockets, usually becoming much firmer within 24 to 48 hours and no grinding may be required. If some grinding is needed, it should be done very conservatively and not with a view to taking the teeth out of occlusion.

If after treatment of a case, movement of the teeth during mastication is found to be such as would interfere with recalcification of bone, or with proper healing in any way, they should be splinted or fixed with some staying appliance that will give an opportunity for complete healing. This may be just as necessary for the best results as the splinting of a broken bone.

In many cases of periodontal involvement where one or more teeth have been missing for a time, adjacent teeth have shifted bodily into the spaces. These shifted teeth even though badly involved and very loose, may be successfully treated and shortly thereafter, orthodontically moved into their normal positions and permanently splinted with fixed bridges. My experience has been that the orthodontic movement followed by permanent fixation seems to encourage bone growth and produce a very successful result.

SIDNEY SORRIN, D.D.S.
New York 22, N. Y.

It is with a great deal of pride that I am privileged to express an opinion on a subject which I have championed for the past twenty-five years. Leonard has most clearly

explained the etiology of traumatic occlusion and its means of detection.

On the question of the method of obtaining occlusal equilibration, an organized method (as we have formerly described) would be more desirable. The generalities expressed, in the main, are correct, but confusing to those who do not fully comprehend the method employed in obtaining occlusal equilibration.

The statement is made that "Ligating with stainless steel wire is sometimes helpful in temporarily supporting loose teeth while healing is occurring." This may suffice on anterior teeth, but cannot be employed on posterior teeth. For the past five years I have used the acrylic splint which I introduced in 1941, and have found it superior to other materials and methods which are used for temporary splinting of teeth.

I cannot agree with the statement, "Fixed bridgework is of very little help in support against buccal lingual motion." I have found that the best restoration is a fixed bridge, utilizing as many abutments as possible. Proper occlusal equilibration and the use of fundamental principles of engineering, will determine the efficiency of the product.

It is very gratifying to realize that the profession now recognizes the importance of occlusal equilibration and its relation to all phases of dental service.

JUSTIN D. TOWNER, D.D.S.
Memphis 3, Tennessee

The "Initial Statement" on "The Occlusal Factor in Periodontal Disease" is sufficiently comprehensive to need little discussion other than emphasis.

Occlusion presents a definite and exacting problem in periodontia. The word implies movement, or excursion essential to mastication, in contra-distinction to centric relation. The former means function, the latter rest contact. Opposing teeth in correct vertical relation are not necessarily in good occlusion.

Since the amount and integrity of the supporting structures determine stress resistance these demand primary consideration, except in instances of extreme extrusion, usually anteriors. In such cases reduction of excessive stress should be done prior to or coincident with treatment of investing tissues. Swelling of the alveolodental ligament, as a result of inflammation, tends to expel a tooth from its alveolus. Teeth slightly displaced by reason of this usually return to original position when such pressure is alleviated.

The periodontium is more resistant to vertical pressure than to lateral stress. For this reason it is essential to study teeth in the process of mastication, especially lateral excursion, and remove tripping surfaces which tend to produce a centric lock. This may be accomplished without the reduction of vertical dimension.

The occlusal factor in periodontal disease is actual and of necessity equals in importance that of any phase of treatment. Whether excessive stress be the cause or result of periodontoclasia there can be no substantial recovery until occlusal equilibrium is established.

CHARLES H. M. WILLIAMS, D.D.S.
Toronto, Canada

The opinion that vigorous function is essential to normal development and maintenance of the periodontal tissues is, I believe, sound. In our teaching we stress that during infancy and childhood vigorous function, particularly incisal function, and the associated obvious wear of the teeth are important to growth of the jaws and the establishment of well-developed periodontal tissues. We further believe that continuing heavy function and continuous wear of the teeth are essential to the maintenance of normal supporting structures throughout adulthood. Natural wear of the teeth should, as the age of the human animal increases, cause reduction of:

1. Overbite and cuspal inclination.
   This favors the gradual establishment of an end-to-end relation of all teeth. The result is that the forces affecting the supporting structures of teeth become steadily less horizontal and more axial.
2. Length of the crown of the teeth.
   The extra-alveolar lever arm (the clinical crown) should steadily be reduced while the supporting intra-alveolar lever arm remains about the same and thus increases in proportion.

If normal development of the jaws and supporting structures has failed to occur and if malrelation of the teeth exist, natural wear of the teeth will, if it occurs, usually produce valuable improvements in occlusal articulation. If natural wear has failed to occur it is often possible to imitate, by artificial grinding, the improved conditions it should have produced.

The following classification of overbite relations as means of choosing a method of occlusal correction is valuable:

1. Slightly abnormal overbite — between 0 and 2 millimetres.
   Occlusal correction by grinding will usually produce excellent to good articular relations.
2. Medium abnormal overbite—2 to 4 millimetres.
   Grinding will often produce good lateral functions and good to fair incisal relations.
3. Markedly abnormal overbite—4 to 6 or more millimetres.
   Grinding may allow fair lateral functions but the incisal relations will usually remain poor.

When the overbite exceeds two millimetres grinding, while it may be the most feasible, is not usually the ideal method of occlusal correction. In such cases the combined use of orthodontic or prosthetic treatment and grinding usually allow good results.

The "Initial Statement" warns against grinding the points of occlusal contact which support centric position because this procedure will cause a closure of the bite. According to my observations natural wear of the teeth up to an obvious degree is almost entirely at the expense of the cusps and it has almost no tendency to reduce the effective centric height. Natural wear affects mainly those parts of the teeth that function in the eccentric to centric movement. A different set of surfaces of the cusps are in contact at static eccentric positions and during eccentric to centric movements than those surfaces which support centric position.

We base a two-stage technique of occlusal correction by grinding on the above observations:

1. In the first stage, the patient is trained to close at the static eccentric positions and the main changes in cuspal height which imitate natural wear are produced.
2. In the second phase, markings are made while the mandible is moved from one eccentric position to centric position. All the markings on all the teeth are ground very slightly but repeatedly until maximum coördination of occlusal articulation for that side is achieved. The process is repeated for all ranges of function.

I strongly disagree with the suggestion in the "Initial Statement" that grinding of the posterior teeth should be mainly on the cuspal inclines of the buccal cusps of the upper teeth and the lingual cusps of the lower teeth. This produces a disharmony of the contacting incline planes on the working side and may, if these cusps are sufficiently flattened, cause the balancing cusps of the other side to be in individual contact. I also disagree with the suggestion "It is also good practise to round the buccal and lingual surfaces so as to make the occlusal surface narrow on teeth with weakened support." The buccal cusp of the lower tooth and the lingual cusp of the upper tooth are interdigitated by the opposing tooth and any grinding on the above named cusps to narrow the occlusal surfaces would not only disturb centric support of these cusps but it would likely seriously interfere with the coördination of the cuspal inclines on these cusps with those on opposing teeth. Any attempt to reduce the width of an occlusal surface should be confined therefore to the non-interdigitated lingual edge of the lingual cusp of the lower tooth and buccal edge of the buccal cusp of the upper tooth.

If it is deemed advisable to attempt to minimize the tendency toward flattening of cusps, it should be accomplished by careful reëstablishment of sluiceways rather than by the rounding of cuspal surfaces. In most cases, it is the edge of a facet rather than the facet itself that constitutes the area of centric support.

In all respects, except those particularly mentioned above, I agree with the opinions of the "Initial Statement" which is excellently concise and yet comprehensive.

Concluding Statement

THE COMMENTS of the discussors are very interesting and valuable. In a communication not intended for publication Dr. Parks writes that he does practically no grinding and that Doctors Merritt and Kirkland also do little if any. I assume that he means that if the root surfaces are cleansed, diseased tissue removed surgically, and good home care instituted that a good result will be attained even though the occlusal factor be ignored.

I am sure that this is only partially true. Many teeth with periodontoclasia are loosened and slightly extruded by inflammation deep down on the roots. Such teeth show lateral thrusts during articular movements. When deposits are removed and the circulation restored these teeth settle down and become firm and may become quite free of movements during articulation.

In other cases the injury of the periodontal tissues is primarily traumatic due to a progressive maladjustment. A closing bite due to loss of one or more molar teeth and tilting of others brings injurious stresses on the remaining teeth for which there is no relief without mechanical adjustment. Such adjustment may lie in the field of crown and bridge rather than grinding but adjustment there must be to stabilize the teeth and give opportunity for traumatized periodontal tissues to regain their circulatory tone. In my experience occlusal adjustment in such cases is essential to establish periodontal health and save the teeth. It is the third leg of the local treatment tripod of which root surface cleanliness is the first and local circulatory stimulation the second. If progressive malocclusion leading to periodontal trauma due to any cause is uncorrected it is difficult and often impossible to restore health to the periodontal tissues. Progressive advancing periodontal destruction occurs on the traumatized teeth eventually leading to the loss of the teeth.

—HAROLD J. LEONARD

Sixth Postgraduate Program for
THE AMERICAN ACADEMY OF PERIODONTOLOGY

Sponsored by

THE W. K. KELLOGG FOUNDATION INSTITUTE
GRADUATE AND POSTGRADUATE DENTISTRY

University of Michigan, Ann Arbor, Michigan

APRIL 29-MAY 1, 1946

MONDAY, APRIL 29

9:00—Registration

10:30—Recent Developments in Fusospirochetal and Related Infections

Theodor Rosebury, M.D., D.D.S.
Assoc. Prof. of Bacteriology
Columbia University
College of Physicians and Surgeons

2:00—Food in Relation to Dental Health

Dorothea Radusch, D.D.S., B.S., M.A.
Assistant Prof. Dept. of Periodontia
School of Dentistry
University of Minnesota

(Demonstration of the practical method of diet analysis. Outline of factors which must be considered in arriving at reliable conclusions regarding the patient's intake. Importance of consistent intake of essential food factors as brought out by a review of recent pertinent research especially as it pertains to mineral needs and to sources of supply.)

3:30—Recent Developments in Fusospirochetal and Related Infections

Theodor Rosebury, M.D., D.D.S.

6:45—Dinner and Speaker

Michigan League

Effects of Starvation Diets on Mouth Conditions

R. Gordon Agnew, M.Sc., D.D.S., Ph.D.
West China Union University
Chengtu, Szechwan, China
Recently returned to Toronto, Canada

TUESDAY, APRIL 30

9:00—Recent Advances in Chemotherapy

Maurice H. Seevers, Ph.D., M.D.
Prof. of Pharmacology
Chairman of the Department of Pharmacology
University of Michigan

10:30—Dental Roentgenographic Diagnosis Including Some Characteristic Dental Findings Associated with Certain Systemic Diseases

Edward C. Stafne, D.D.S.
Section on Dental Surgery
Mayo Clinic
Rochester, Minnesota

2:00—Progress and Problems in Diabetic Therapy

Charles H. Best, M.D.
(Co-discoverer of insulin)
Banting Institute
Toronto, Canada

3:30—Cysts of the Jaws

Edward C. Stafne, D.D.S.

7:30—Dietary Factors in the Protection of Liver and Kidneys

Charles H. Best, M.D.

WEDNESDAY, MAY 1

9:00—The Physiology of Digestion

Smith Freeman, Ph.D., M.D.
Professor of Physiology
The Medical School
Northwestern University

10:30—Electron Microscope Study of the Enamel and Fluorosed Teeth

Charles H. Gerould
The Dow Chemical Co.
Midland, Michigan

2:00—The Effect of Impaired Digestion upon Health and Nutrition

Smith Freeman, Ph.D., M.D.

3:30—General Discussion